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ABSTRACT

The 10 lessons in this manual for secondary school teachers address concerns ranging from water sources and pollutants to government programs and water treatment methods. The materials are intended to help students understand the sources of drinking water, how water can be made safe for drinking, and the health threat that contaminated water represents. Although this curriculum relates primarily to science, health, and social studies lessons, the follow-up activities also involve skills developed in art and English classes. Each lesson plan contains a materials list, general introduction, vocabulary, instructional activities, and suggested supplementary activities. Included with the lesson entitled "Alaska's Water Sources and Problems," are detailed data from each of the state's regions. (Author/WB)

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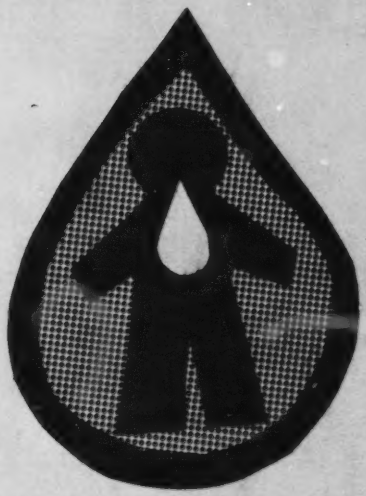
SAFE DRINKING WATER FOR ALASKA



Curriculum for Grades 7-12

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SE 035 428

FOR THE HEALTH OF YOUR FAMILY...

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IS YOUR DRINKING WATER SAFE?

This booklet was prepared by the

SOUTHEAST REGIONAL RESOURCE CENTER

WRITTEN AND ILLUSTRATED BY: KRISTINE ALLEN

for the

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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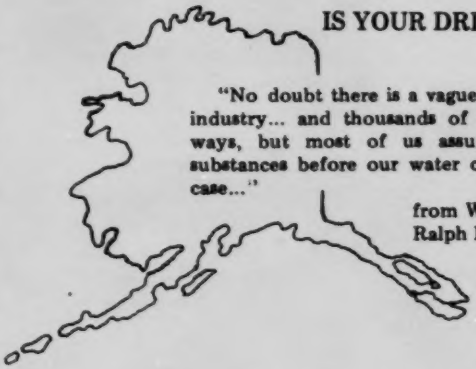


IS YOUR DRINKING WATER SAFE?

"No doubt there is a vague awareness that toxic chemicals from industry... and thousands of other contaminants enter our waterways, but most of us assume that 'somebody' removes these substances before our water comes out of the tap. This is not the case..."

from Water Wasteland, a 1972 report of the Ralph Nader study group on water pollution.

From the rain forests of the Southeast to the semi-arid expanses of the northern slope, Alaska has abundant quantities of water. From region to region its uses vary—transportation, power generation, mining operations, and fish and wildlife habitats. The water we use to drink, however, is often taken for granted as safe.

Alaska has millions of acres of uninhabited wilderness where evidence of man's polluting influences are at the present time minimal. Alaskans have always lived very close to their natural resources. Many rely on water for their livelihoods and subsistence, so it is important that our waters be kept safe for all their many uses.

Alaska, at present is relatively undeveloped, but as our population grows and as our natural resources are explored and developed, the need increases to learn more about how we keep our waters safe. The quality of drinking water can vary greatly from community to community, and even house to house, depending on which sources are used. But there are also problems that are common to specific geographical regions. This booklet discusses contaminants and health hazards associated with Alaska's drinking waters, with particular attention to those which present regional problems. Where do you live, and is your drinking water safe?

****

Alaska encompasses a land area of 586,300 square miles, with a coastline of approximately 46,300 miles. Alaska has great rivers, huge lakes, large amounts of underground water, and areas of rain-forest precipitation. Glaciers supply streams and lakes with water frozen thousands of years ago.

Climatic factors influence both life forms and life-styles considerably and have a great impact on our water resources. Because of cold winters, little precipitation, and permafrost, vast areas of the state have little available water during much of the year. Other areas have either great precipitation, as in Southeast; or extensive groundwater resources, as in the Rural Interior. But problems both manmade and natural affect the quality of drinking water.

There can also be a shortage of water where the demands on a water source cannot be met. Much of Alaska's population and associated industrial activity are located close to our natural watersheds. Problems of wastes contaminating water supplies, overuse, or overdevelopment are major issues of concern.

Contaminated water supplies directly affect health. Many rivers and streams which are crystal clear give the false impression that the water is pure and safe to drink. The clarity of the water is not an indication of the presence or absence of bacteria. These water supplies may be contaminated by disease-causing organisms from improperly disposed human wastes, or waste from other animals. Spring flooding creates an additional problem to water supplies from contaminated wastes, sediment and other pollutants washing into the water source from overflow. Water may contain natural contaminants such as arsenic, nitrate, or mercury, which are also hazardous to your health.

Cloudiness, or turbidity, is considered a physical contaminant to drinking water. It is caused by minute particles which remain suspended in the water. Excessive turbidity may shield disease-causing organisms from removal by most treatment processes. Turbidity also makes water unappealing to many people.

Most of us assume that unless the water looks dirty or tastes bad, it is safe for drinking. However, oftentimes contaminants are not only colorless, but also odorless and tasteless. Without proper protection or treatment, contaminated water can cause chronic or acute illness.

Alaska is a vast land composed of diverse environmental areas. Some drinking water problems are common to specific areas, while others are found statewide. The prevalent threats to human health in **Rural Southeast, Rural Interior, Rural Arctic Coast,** and **Urban** areas are the focal point of the following discussion. It is important to know the facts about your area because the impact is on you and the health of your family.

****

Rural Southeast:

*Emergency order issued on Switzer Creek (July 24, 1974): 33 cases of salmonella were confirmed in Juneau, caused by the introduction of untreated wastes into residential (trailer court) water distribution system.

*Ketchikan laboratory studies disclose gulls in disease spread (April, 1954): Studies done by the Ketchikan Public Health Laboratory have connected sewage disposal, water supply and gulls in spreading salmonella disease-producing organisms from contaminated sources into public drinking water supplies.

Polluted water sources involving improper sewage disposal systems have been major factors in these outbreaks. In occurrences such as these contaminated drinking water was found to be the means of transmission. Harmful microorganisms from human and animal wastes, if present in water sources and not properly treated, can cause such waterborne diseases as giardiasis, salmonella, shigelloses, typhoid fever, infectious hepatitis, dysentery, and skin infections such as impetigo.

Rainwater collection is a common practice in Southeast where precipitation is usually high. Rainwater meets the needs of small water users where wells or other surface water sources are not feasible. Collected rain does not contain concentrations of minerals found in most groundwaters or dissolved minerals such as sulfur and iron, which often give water an objectional taste. There is no danger of contamination from human waste; however, bacterial contamination can occur from birds dropping waste on roofs where rainwater is collected. Roofing materials may also contain harmful chemicals which can get into the collected rainwater. Radioactive particles can also be washed from the air. Rainwater needs to be filtered and disinfected to be safe for drinking.

The high water tables and shallow soils with high bedrock common to Southeast present problems to the conventional on-lot sewage disposal systems of septic tanks with leach fields. The ground water in areas with high water tables can become contaminated when septic systems are flooded and proper biological breakdown cannot take place. In areas with shallow soils, the liquid wastes all too often surface and drain into streams. (Surface streams are used quite often as water supplies for one or more families.)

Unappealing color and turbidity in drinking water from surface sources are common in Southeast. They present health hazards if a) turbidity prevents adequate disinfection of disease-causing organisms, and b) when the displeasing appearance, tastes, or odors of the water make users go to another, less safe source of drinking water.

Iron is probably the most common drinking water problem in Southeast groundwater, though it is primiarily an aesthetic problem.

Rural Interior:

*Restaurant near Tok Junction (August 20 - September 2, 1971): 112 cases of gastroenteritis were attributed to contaminated water at a roadside restaurant on the Alaska Highway between Tok Junction, Alaska and Whitehorse, Yukon Territory.

*Arsenic in waters of Ester Dome Area (February, 1976): At least 30 families were shown to be intoxicated with arsenic contamination from domestic well waters. The arsenic contaminated groundwater samples were all located on a mineralized belt extending in an arc from Ester Dome to Pedro Dome-Cleary Summit.

*From 1936-1951 in the areas of Kuskokwim River and Nushagak Bay, many outbreaks of thyphoid and dysentery occurred. These outbreaks were attributed to summer fishing camps consisting of tents crowded together with no sewage facilities. Drinking water for both man and animals was collected at the most convenient pond or creek.

The Rural Interior regions of Alaska encompass a diversity of environments, and a great variety of water resources. Water supplies are generally the most convenient river, stream or lake. In areas where precipitation is high, rainwater is used. Wells are a source of water in areas away from river systems and where permafrost is not too deep. In general the Rural Interior has abundant water resources, however, many factors control the quality and quantity for drinking water.

Seasonal climate changes are the major limiting factor of these sources. During winter months, most surface waters freeze. In some areas, water can be drawn from below the ice, or the ice can be cut and hauled to be melted in the home. This decrease in water flow affects health in that sufficient quantities are necessary for personal hygiene.

Quality can be degraded during the spring runoff period from wastes seeping into surface or groundwater sources from snow melt. In some areas, this dramatic increase of surface waters causes flooding. Flood waters can further contaminate a water source from overflows washing over land where human or animal waste may be deposited.

Rainwater is another seasonal source of water. Precipitation is strongly influenced by the mountain ranges in this area. Most precipitation comes from the south and decreases as it moves northward through the Alaska Range, causing northern regions to be semi-arid. The western portion of the Rural Interior does receive abundant rainfall during part of the year, and uses it as a source of drinking water. (Advantages and disadvantages to rainwater collection are discussed in the section on Southeast.)

In many areas of the Interior there is an abundance of groundwater, but once again quality and quantity of these sources can vary. In locations away from river systems, the available groundwater is often restricted by permafrost. The presence of frozen ground necessitate deeper drilling for water. A well that passes through great thicknesses of permafrost often freezes up. Iron in drinking water can be common. In areas where shallow wells are feasible, water can be high in dissolved solids and contaminants which filter in from the surface. Some ground and surface water naturally contains varying amounts of chemicals which can adversely

affect human health. Some of the chemical contaminants and their related health hazards are as follows:

Arsenic—a natural contaminant which, when consumed over a long period of time, can cause skin irritations, changes in skin color, and gastrointestinal and neurological distrubances.

Nitrate—poses an immediate threat to infants under three months of age by producing an anemic condition commonly known as "baby blue."

Mercury—levels in water can occur naturally or can be caused by industrial and agricultural use. Mercury poisoning in large doses may be acute; or chronic when in low doses over a period of time.

Other chemicals in water such as iron and manganese although acceptable from a health standpoint, may be undesirable because of odor, appearance, or taste. Scientists are still exploring the exact long-term, low-level effects on human health by many of these chemical contaminants.

Rural Arctic Coast:

***Since 1922, in the Barrow area alone, there have been 47 cases with 4 fatalities from typhoid fever and 31 cases with 1 fatality of paratyphoid fever. All were attributed to contaminated water.**

***In the 1948 outbreak of Bacillary dysentery in Cape Halkett in the Barrow area there were 105 cases with 1 death, over a 5 month period. The water from Barrow village came from a lake, and during winter months, the slopes draining into the lake were used as the disposal area for human wastes.**

Due to climatic factors and geographical location, the Arctic Coastal Region of Alaska faces the most severe problems of limited usable water. The Brooks Range, which forms the southern border of the arctic area, removes most of the moisture as air masses move northward causing annual precipitation to be that of a desert—about 5 inches. Permafrost in this area is continuous and deep, aggravating problems of water availability. During winter months, extreme water shortages exist because surface waters freeze entirely, making them nearly impossible to use. Water availability problems in the Arctic region directly affect health and restrict economic growth.

The complexity of water quality problems is vast in an area where limited water supplies are a major issue. Difficulties in treating waste water pose the biggest threat to available water supplies. Spring flooding in many areas of this region can further contaminate water sources by washing over land where human or animal waste may be deposited. In coastal communities, saltwater penetration into groundwater has also limited the quality of drinkable water. Oil and gas or mining operations now or will present competition for water supplies and a potential for water quality degradation. Measures must be taken now to protect the quality of available water. Both water availability and quality have a direct impact on health in that adequate amounts of safe water are needed for consumption, personal, and household hygiene.

There is a great need for development of adequate water storage and treatment facilities, distribution systems and sewage disposal systems. In colder climates, the capacity of water to assimilate wastes is much lower. The temperature of these waters seldom rises above 10^{O} to 20^{O} C, which retards biological and chemical reactions that naturally break down *some* wastes. However, bacteria, viruses and other sources of disease cannot be so removed.

Only the sparse population of this area and relatively low quantities of contaminants have kept water quality and availability under control. As Alaska develops and population pressures on the environment increase, so will the need to develop adequate water related systems.

Urban:

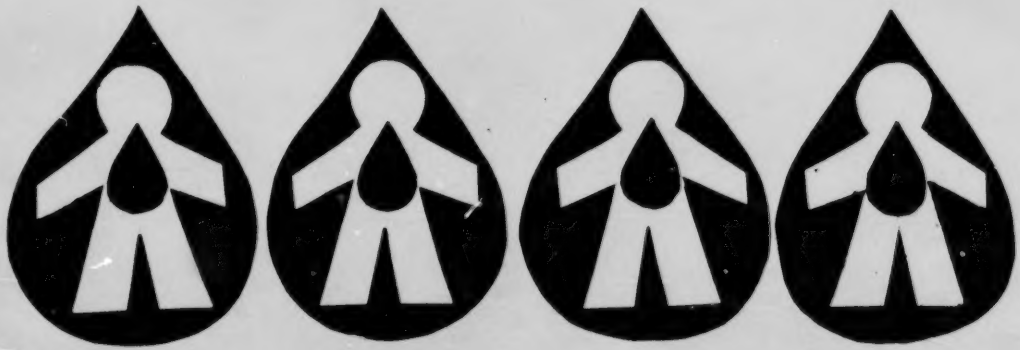
*On November 16, 1971, a trailer court tenant in Anchorage telephoned local health authorities to complain that the water was "dirty and had a bad odor." Upon investigation, the sanitary engineer found what appeared to be gross sewage contamination in the well water supply. Raw sewage backed up through the drain from a "soft plug" obstructing the borough sewer and spilled over the casings into the wells. Further investigation revealed 89 of 114 persons exposed were ill. The shigellosis symptoms included nausea, vomiting, abdominal pain, fever and diarrhea.

*In 1950, there was a typhoid fever outbreak involving 17 children. This outbreak occurred in the congested area outside Anchorage city limits where the people were dependent on shallow wells for water and single-premise sewage disposal (generally cesspools or privies). The outbreak was found to be from water contamination.

Contaminated water supplies and improper sewage disposal have been major causes of outbreaks like these. In all instances, poor sanitation played an important role. The crowding of people in urban areas increases health hazards. Rapid growth without suitable planning and development of water-related facilities can impact public health considerably.

As population increases, so will the demands on water supplies to support associated industrial and economic growth. Water shortages can develop from over-allocations of water supplies. The projected water needs for the Anchorage area have already exceeded the present known supplies. The lake levels in this area have been lowered significantly due to heavy demands on groundwater sources. Urban areas and their associated economic growth are very dependent on the quality of water on a sustained basis.

Another danger to existing water sources in urban areas is the problem of urban runoff. Pollutants are carried into our water supplies from the discharging of storm water, snow removal, sedimentation from land-development activities, etc. Systems must be developed to deal with these overflows before permanent damage to our waters occur.



FOCUS: CLEAN WATER STANDARDS

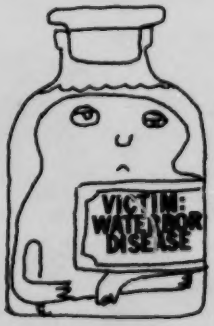
The Department of Environmental Conservation has set standards for the level of contamination allowed in drinking water. Microbiological, chemical, physical, and radioactive contaminants are all known to adversely affect human health. Periodic sampling is the only way to tell if a source is supplying safe water. It is important to know whether your water exceeds the standards and what treatment will protect your health.

Microbiological Contaminants—There are a great number of these contaminants that can be present in a water source and oftentimes are difficult and expensive to detect. However, the presence of microorganisms called coliform bacteria, commonly found in human waste, is used as an indicator of bacterial contamination that may result in waterborne diseases.

Chemical Contaminants—Levels have been established in the Alaska Drinking Water Regulations for arsenic, barium, cadium, chromium, fluoride, selenium, silver, and sodium. In addition, levels have been set for six organic chemicals found in pesticides.

Physical Contaminants—Cloudiness and color characteristics of water can indicate an unhealthy water source. Particles suspended in a water source can protect disease-causing organisms from disinfection and also interfere with tests for coliform bacteria.

Radioactive Contaminants—These may be either natural or man-made. Natural sources are sometimes in ground-water, while man-made radioactive contaminants may be present in small amounts in rainwater or surface waters. Although at present not a significant problem in Alaska, radioactive waters could accompany future development of the state.



SOURCE PROTECTION AND TREATMENT

The most basic method of insuring the safety of drinking water is to protect the water source. The watershed, from which ground and surface waters flow, must be kept as free as possible from sources of contamination.

To protect contamination of well water, wells must be properly constructed and kept at safe distances from contaminating sources. (Requirements for drilling and construction of wells can be found in Alaska's Safe Drinking Water Regulations.)

The quality of the water source generally will determine the treatment process required to provide safe drinking water. Some of the water treatment techniques commonly used in Alaska are as follows:

Chlorination—Currently most water utilities use chlorine for disinfection. The ability of chlorine to kill microorganisms is directly related to the chlorine concentration and contact time. In sufficient quantities and with adequate contact time, it will kill coliform bacteria and disease-causing organisms. It also reduces some of the bad tastes and odors.

Filtration—Filtration is used in many water systems, especially those using surface water as a method of treatment. Filtration can remove suspended particles, color, and helps reduce objectional tastes and odor. It can be effective in removing spores of organisms which are not killed by disinfection. Filtration combined with chlorination provides an adequate treatment for most water supplies.

Chemical Treatment Techniques—Community and city public water systems usually use treatments consisting of adding chemicals which condense most contaminants into "floc" in the water. This floc is then allowed to settle and then is filtered out, removing with it many of the objectionable odors or tastes. Properly operated, these systems provide pure and safe drinking water.

****

Safe drinking water is extremely important to the health of you and your family. So don't take your water for granted.... BE CONCERNED!!!!!!!!!!!!

For more information call your local city or borough environmental health authorities or contact your regional environmental supervisor of the Alaska Department of Environmental Conservation.

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376-5038

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Soldotna, Ak. 99669
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Valdez Field Office
Drawer 1709
Valdez, Ak. 99686
835-4698

Northern Regional Office
P.O. Box 1601
Fairbanks, Ak. 99707
(675 - 7th Ave.)
452-1714, 1715

EMERGENCY WATER PURIFICATION TREATMENTS

BOILING—Boil water for one minute. Bring to a full rolling boil, not simply steaming. If the water has a flat taste, pour back and forth between clean containers 2 to 3 times.

IODINE—treatment can be accomplished in a number of ways. There are several products now on the market which simplify this procedure. Whatever method is used, iodine treatment is an effective method of disinfection and very practical for travelers as well as for home use.

The following quantities are based on water temperatures being 37°F.

1) In a one-ounce clear glass bottle with a hard plastic cap, put 4-8 grams of U.S.P.-grade resublimed iodine—iodine crystals.

2) When water is to be treated, fill bottle with water and shake vigorously for 30-60 seconds. This will dissolve some of the iodine from the crystals. (*The concentration of the iodine solution depends on the water temperature. As water temperature increases, the amount of the solution used for disinfection decreases slightly.)

3) The iodine solution is used to disinfect water, not the crystals themselves. So it is important to let the crystals sink to the bottom before using. Carefully pour 1/2 ounce* of the iodine solution into each quart of water to be disinfected.

4) After adding iodine solution to the water, mix thoroughly and allow to stand 30 minutes before drinking.

When more disinfected water is needed, the above steps can be repeated until the iodine crystals in the bottle are used up. The shelf life is unlimited.

CHLORINATION—is the most commonly used method of disinfection of water and one usually recommended by public health authorities.

1) Add one drop of household bleach such as Clorox or Purex (containing 5.25% available chlorine) to each quart of water.

2) If the water is cloudy, add three drops of the solution to each quart of water.

2) After adding the chlorine solution to the water, mix thoroughly and allow to stand 30 minutes before drinking.

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The following materials have been funded by a grant from the Department of Environmental Conservation and developed by the South East Regional Resource Center.

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ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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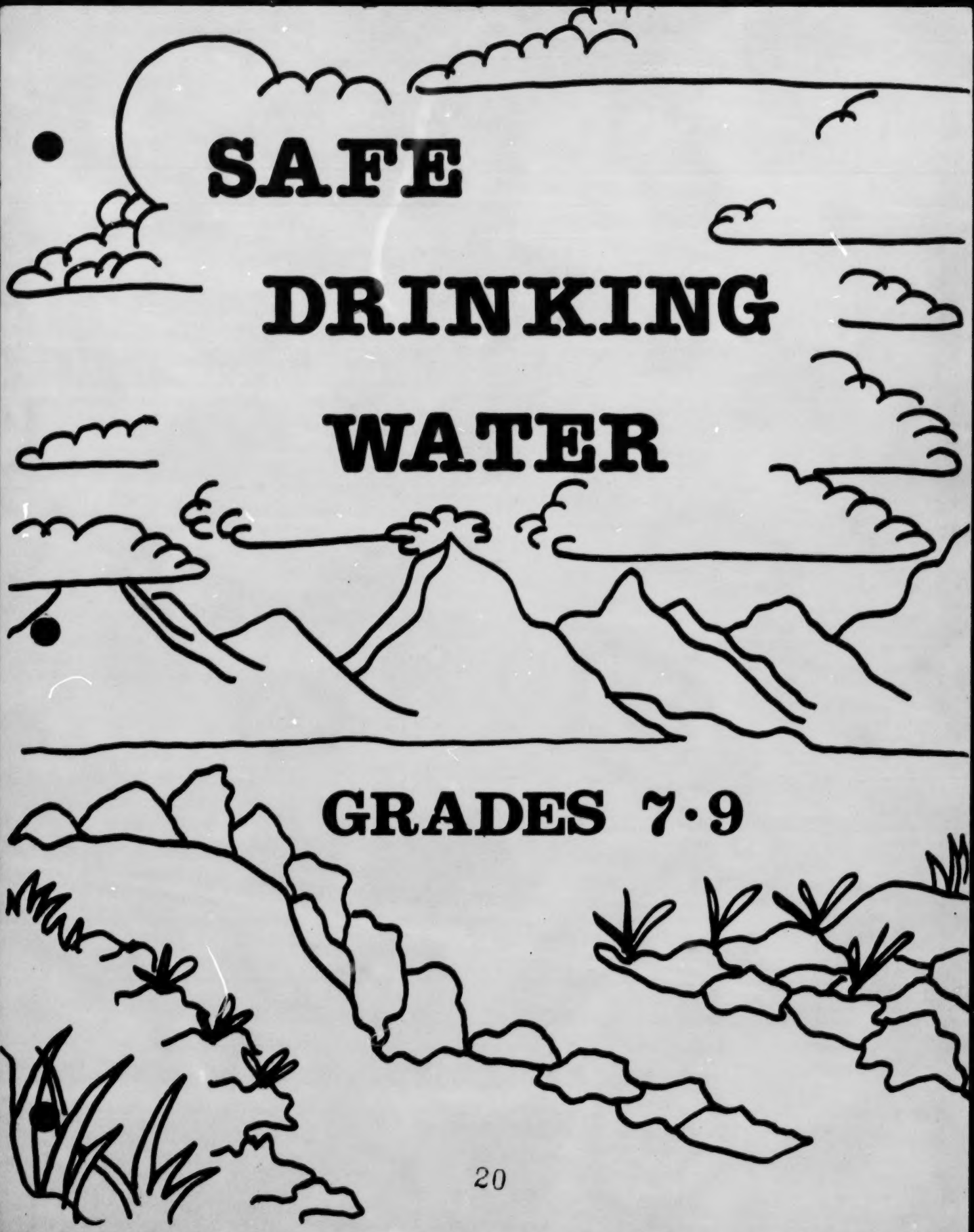
SAFE
DRINKING
WATER
GRADES 7-9

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

JAY S. HAMMOND, GOVERNOR

POUCH O – JUNEAU 99811

January 29, 1980

Dear Alaskan Educator:

In a land of sparse population, abundant wildlife, clear waters and good fishing many Alaskans are lulled into thinking their drinking water is pure as the proverbial "driven snow." While there isn't a high degree of industrial pollution associated with urban development, Alaska does have very real health hazards. Localized pollution problems do exist, and often occur where they are most likely to present a threat to human health--in the communities where people live.

This curriculum material on safe drinking water in Alaska has been designed to provide students with a basic understanding of the sources of the water they drink, how drinking water can be made safe, and the health threat that unsafe water represents. The children to be presented with this unit are continuously exposed to health threats that may exist in their communities, and will one day, like their parents, have to pay the price for safe drinking water. This price is paid through user fees, treatment supply and distribution equipment, and water testing.

This curriculum is multi-disciplinary and can be approached from any of the following subject areas with little adaptation: health, science, social sciences, and government. The suggested activities include skills developed in art, English, drama, and library classes. This curriculum could be used very effectively when coordinated between classes taught in several subject areas.

We hope you find this material to be very useful in helping your students meet your own learning objectives and at the same time learn about causes and solutions to one of Alaska's significant environmental problems.

Sincerely,

Ernst W. Mueller
Commissioner

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Safe Drinking Water

Introduction:

This series of five instructional units has been designed with the intent of providing students with information concerning safe drinking water and the potential threat of contamination. The series begins with a general overview of water pollution on a global or national scale. It will discuss pollution problems of Alaska, health hazards, and chlorination. The culminating activity is a proposed field trip to the local water treatment facility and/or water source which reviews and makes real all the previously learned information.

Lesson one expects students to have some familiarity with the concept of water pollution, but assumes they have not developed a personal concern about the problem. This lesson, therefore, aims at generating personal concern for the relation between health, disease and the quality of drinking water. Lesson two informs the students of how the problems of safe drinking water affect Alaskans. Introduced in this lesson are micro-organisms that may occur in large enough numbers to cause problems.

The next lesson develops the role micro-organisms play in the Alaskan water pollution problem through the use of microscopes, slides, films and student information/drawing sheets.

The fourth lesson introduces and defines non-living pollutants, traces their sources, and identifies health hazards arising from such pollution. Lesson five is a visit to the community's water treatment facility or water source. This visit provides a concrete reference on which the students can focus what they have learned.

Flexibility is a prime goal in the use of these lessons. The lessons may be taught in any order depending on the needs of the students and the availability of resources.

TEACHER RESOURCE LIST

The resources listed below can be found in the Alaska State Library system.

Adler, Irving, The Environment, 1976 (J 574.5 ADLE)

Borsoff, Norman, Don't Give Up, 1972 (J)

Bova, Benjamin, The Seeds of Tomorrow, 1977 (J 301.3 BOVA)

Brennan, Nicholas, Olaf's Incredible Machine, 1975 (J)

Dwiggins, Don, Spaceship Earth; A Space Look at our Troubled Planet, 1970 (J 628.5 DWIG)

Elliot, Sarah M., Our Dirty Land, 1976 (J 363.6 ELLI)

George, Jean Craighead, Hook A Fish, Catch A Mountain, 1975 (J)

George, Jean Craighead, Who Really Killed Cock Robin? An Ecological Mystery, 1971 (J)

Gregor, Arthur S., Man's Mark on the Land, 1974 (J 301.31 GREG)

Hoff, Sydney, Amy's Dinosaur, 1974 (J)

Hyde, Margaret Oldroyd, For Pollution Fighters Only, 1971 (J 628.5 HYDE)

McCoy, Joseph J., Shadows Over the Land, 1970 (J 628.5 MCCO)

Meyer, Louis A., The Clean Air and Peaceful Contentment Dirigible Airline, 1972 (J)

Peet, Bill, The Wump World, 1970 (J)

Pomerantz, Charlotte, The Day They Parachuted Cats on Borneo: A Drama of Ecology, 1971 (J 574.509 POME)

Lesson I — Qualities of Safe Drinking Water

Objective: Students will identify four human activities contributing to water pollution and four steps to pollution prevention with an accuracy of at least 60% following a film presentation on water pollution.

Material:

Film on water quality:
AK. Library call #30028
or #13048 (see Films list, pp. 7 - 8)

Pamphlets: "Issues and Choices"
"Is Your Drinking Water Safe?"
(can substitute for film if unavailable)

Pamphlets are available from:
AK. Dept. of Environmental Conservation
Information Office, Pouch O
Juneau, Alaska 99811

1 Student response sheet: "Water Pollution Table" (pg. 9)

Introduction: Students by this age should have some familiarity with the concept of water pollution. Their knowledge of this may come from media exposures, information from school, personal experiences, or some combination of sources. It is unlikely, however, that the concepts they have are sufficiently developed to have generated a personal concern about the problem.

Water pollution is a serious problem worldwide. It affects the health and well-being of many people. Clean water, along with clean air, is one of the most important conditions of our environment. Our environment includes all conditions of climate, vegetation, animals, bodies of water, landforms and soil. Any change in one part of the environment affects every other part. The study of the interrelationship between life and the environment is called ecology.

This lesson aims at generating personal concern for the relation between health and disease and the quality of drinking water.

The film is a way to provide an instructional base that may be used to narrow the initial range of information as well as previewing the subject and providing motivation for the unit.

The "Water Pollution Table" will require a short time, after the film screening, to complete. If time allows, draw a similar table on the chalkboard and ask the class for their responses. This provides immediate feed-back for the students and presents the main points to the class in a readily accessible form.

Instructional Activities:

1. Select and screen a film from the list of available titles in the Alaska State Library film collection.

2. Assess general level of knowledge about water pollution. Evaluate the range of information the class has:

   Ask if they can define water pollution.
   How does water pollution affect human health?
   Is your drinking water treated in some way?
   Where have they heard of water pollution?
   What experiences have they had with water pollution?
   Has anyone known someone or seen an animal that was sick because the drinking water was not safe?

3. Develop questions from the class on the chalkboard related to water pollution. Begin with any unanswered questions from (1) above. Direct the content of each question to specific information that is available (pamphlet or the resource material you may have). Limit the number to five or ten specific answerable questions.

4. Tell the students that they will, after the film, be responsible for filling out a water pollution table in addition to answering one or more of their questions while in a discussion group (the table may be passed out prior to viewing the film if desired).

5. Allow time for completion of the "Water Pollution Table" handout. Any questions left unanswered by the film should be added to the list developed at the first of the lesson.

6. Break the class into discussion groups to answer one or more of the questions from the list. Develop ways to use school resources to find answers to the discussion questions. If resources do not exist, have students

brainstorm possible solutions to water quality problems.

7. Have groups present their discussion problems to the class and report on their findings or ideas.

FILMS

34733 Drop by Drop to the Sea -
Examines ocean contamination and pollution. Depicts the ocean environment (flora and fauna and the effects of pollution).

10386 A Future For Every Child -
Contrasts a revolving earth devastated by overpopulation, hunger and pollution with a happier planet where population growth is checked.

33347 House of Man, Pt. 1 - Our Changing Environment -
Discusses the waste of natural resources in cities, woodlands and farmlands, and the pollution of rivers and the air. Compares the progress achieved through wasteful methods and through intellegence can be channeled to plan for progress.

10334 Let No Man Regret -
Shows how the unspoiled beauty of nature is being endangered by man's pollution and uncontrolled development by illustrating the phrase, 'Let no man regret that I passed here'.

*30028 Clean Water
Portrays the importance of natural waters. Illustrates the danger of pollution to fish and wildlife city water systems, recreational facilities and public health. Proper sewage treatment for preventing this pollution is explained by animated diagrams.

12630 Conservation Waterfall -
Creates a classroom atmosphere which stimulates inquiry into the need for conservation of America's natural resources and natural beauty.

42096 Development -
Explains development as change in size, form and complexity of organization. Discusses the importance of environmental factors, such as availability of water, minerals and light to development. From The AIBS Modern Biology Film Series. Pt. 3, Multicellular Plants

20291 Pollution Solution -
Discusses how LANDSAT'S remote sensing capabilities can aid in resolving environmental quality problems. Shows that the satellite can locate and monitor strip mining operations to facilitate land reclamation programs, help solve meteorological mysteries by tracking the path of airborne pollution and monitor the course of industrial wastes and garbage dumped into our lakes, rivers and coastal areas.

42191 The Problem with Water Is People -
Traces the Colorado River watershed from the snow-covered Rockies to the delta in Baja California. Discusses water usage and equitable division of water, especially between California and Arizona. Narrated by Chet Huntley

30402 The Third Pollution -
Portrays America's solid waste problem and its relation to air pollution and water contamination. Outlines alternatives for community action, including procedures for obtaining federal or state assistance.

42445 Water - Old Problems, New Approaches -
Tells the story of water shortage problems and how scientists are combating them. From The World We Live In Series.

12149 Water for the Community -
Describes the source of a community's water supply, and tells how the water is treated from the time it leaves its source until it is purified and distributed in the community.

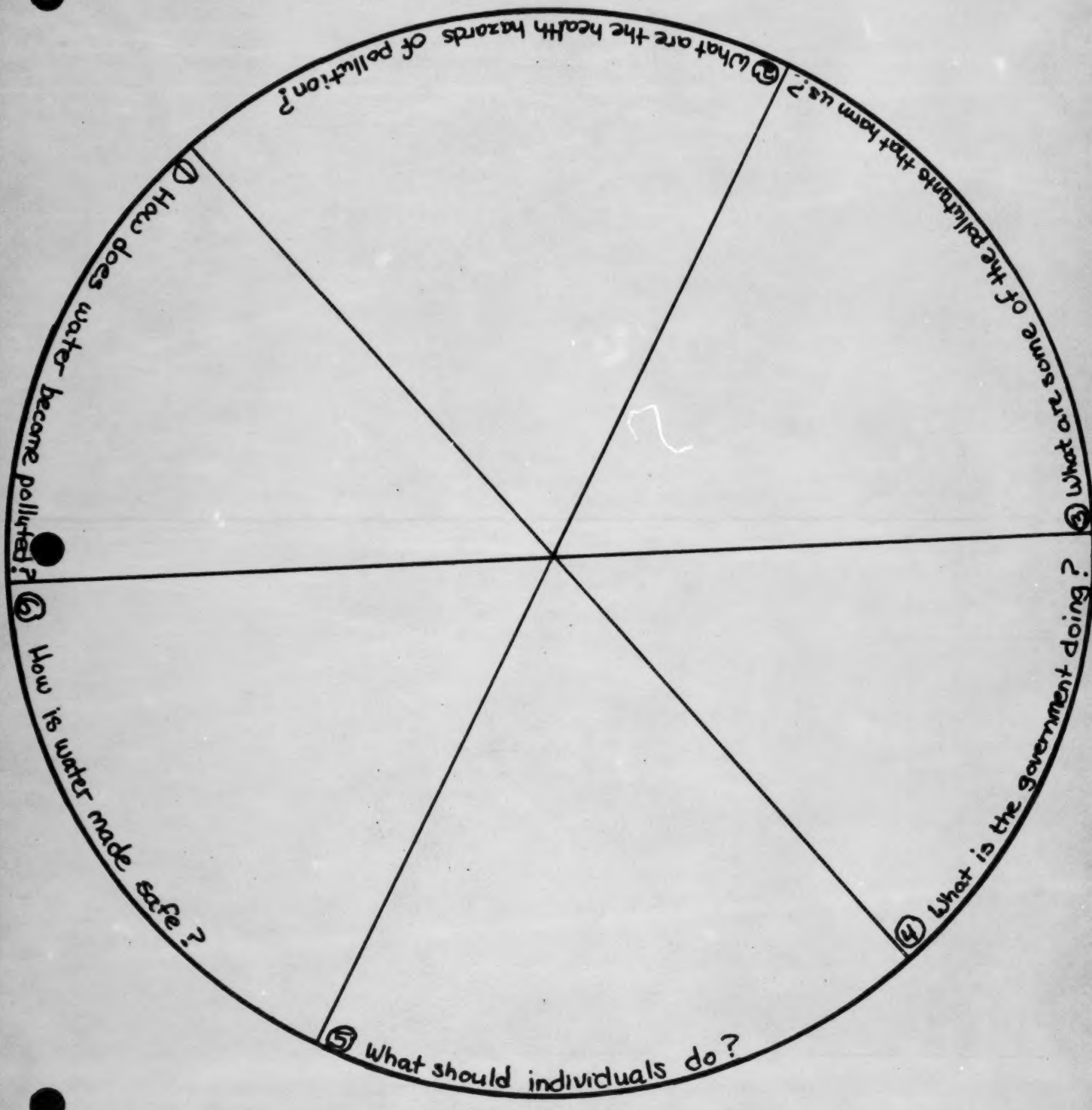
*13048 Water Pollution -
Encourages student concern about the abuse of natural resources, tracing the causes and results of water pollution. Shows how clear water becomes contaminated and useless as garbage, sewage, insecticides and industrial wastes flow into rivers, lakes and streams. Points out that science alone cannot fight the battle against pollution.

*films recommended for Lesson 1

WATER POLLUTION TABLE

From the information on water pollution which you have seen or read about, complete this table by writing in what you have learned in each of the following categories. If you have your own ideas, write them in also.

(JH #2)


① How does water become polluted?
② What are the health hazards of pollution?
③ What are some of the pollutants that harm us?
④ What is the government doing?
⑤ What should individuals do?
⑥ How is water made safe?

Lesson II — Safe Water for Alaska

Objective: Students will survey the quality of Alaskan water through a series of readings and answer a Water Problems check with an accuracy of at least 60% of the questions.

Materials:
2 student reading materials: "Alaskan Safe Water Problems" (pp. 12-14) and "Water Cycle" (pg. 16)
2 student response sheets: "Alaskan Safe Water Problems" (pg. 15) and "Water Cycle" (pg. 17)

Introduction: It is unrealistic to think that, because of Alaska's small population in comparison with its vast natural environment, there are no threats to safe drinking water supplies. Inhabited places in Alaska, though few, are densely populated.

For the most part the contamination that causes illness cannot be seen. Bacteria, algae, and protozoa need only the right conditions in which to flourish. These micro-organisms may occur in large enough numbers to cause problems in communities of any size.

In addition to the micro-organisms, there are other substances that can befoul and even poison water systems, making them not only unsightly and bad tasting, but hazardous to human health. This lesson informs students of threats to safe drinking water which exist in Alaska.

Instructional Activities:

1. Introduce the basic concept of the water cycle using the handout.

2. Distribute "Water Cycle" fill-in. Allow time for students to identify the key terms by filling in blanks.

3. Assign reading of the background information: "Alaskan Safe Water Problems"
   Tell the students that this reading material will inform them of how the problems of safe drinking water affect Alaskans. They will be responsible for reading the article and answering questions on the important aspects of water pollution.

4. (optional) Brainstorm for ideas from the students, based on their reading, of what affects Alaska's water purity.

5. List all polluting activities or substances on the board and expand these general subjects into specific cause and effect relationships.

6. Hand out the "Alaskan Safe Water Problem" student response sheet and allow time for completion. This could be an individual or group effort.

Alaskan Safe Water Problems

Most Alaskans take the purity of their drinking water for granted. Few of us think twice before filling a glass, whether from city supply, basement well, or campsite creek. Unless water looks or tastes "bad," we don't question that it is safe to drink. However, most drinking water contaminants cannot be seen or tasted. Bacteria, viruses, inorganic and organic chemicals all can lead to chronic or acute water-borne diseases.

Alaskans are fortunate to live in an environment which is largely uncontaminated by humans. This does not mean, however, that we shouldn't be concerned about our drinking water. Even in unpopulated areas, water from ponds, streams, and other surface sources is likely to be contaminated by animal wastes or chemicals from natural sources. Water from wells and springs is less likely to be polluted but may contain high concentrations of dissolved minerals or gases. The following are possible drinking water problems of which we, as Alaskans, should be aware.

Water, as obtained from natural sources, may be contaminated by disease-causing organisms which make it unsafe to drink. Germ-laden water can cause infections of the intestinal tract such as salmonellosis, cholera, gastroenteritis and dysentery. Other serious illnesses often caused by contaminated drinking water are typhoid fever, infectious hepatitis, and hydatid disease, a fatal condition caused by ingesting tapeworm eggs sometimes found in the feces of dogs, wolves and foxes.

Chemical contaminants in drinking water may also adversely affect human health. In some cases, medical science has yet to determine the exact effects on humans of long-term, low-level exposure to these chemicals. We do know, however, that water supplies, particularly surface waters, are being degraded by the use of chemical compounds in agriculture, industry, institutions, and homes. Industry uses hundreds of thousands of potentially toxic chemical compounds and many hundreds of new chemicals are developed each year which can contaminate both surface and ground waters. There is suspicion that cancer, genetic mutation, and birth deformities are related to many of the chemicals found in water.

Some Alaskan drinking water naturally contains large amounts of chemicals such as nitrate, which can cause a condition in infants similar to "blue baby," and arsenic, which can cause chronic toxicity. Water may be high in calcium and magnesium which make it undesirable for laundering, bathing, or cooking. Some water may be acceptable from a health standpoint, but may be objectionable because of odor or taste.

The Department of Environmental Conservation, the State agency charged by law with protecting Alaska's land, air, and water, has developed a safe drinking water program for Alaskans. The program is designed both to meet the unique needs of Alaskans and to comply with the federal legislation. The Department has developed a new set of drinking water regulations for Alaska which apply to all public water supplies. These regulations will affect all sources of public water systems, but not private water supplies for individual homes. Public water supply systems include those in trailer courts, restaurants, logging camps, seafood processing plants, towns and cities with water systems, apartment houses, schools, office buildings, etc.

...Protection of the Source...

Protection of the water source is the most basic method of insuring that your water stays safe and pure. The watersheds from which ground and surface water flow must be protected from contamination. Discharge of wastewater solid wastes and other contaminants must be carefully controlled in these areas.

The importance of proper well construction cannot be over-emphasized. Faulty construction is the chief cause of wells becoming contaminated by polluted surface water. To prevent contamination, wells must be properly cased, grouted and sealed. Required provisions for drilling and construction of wells can be found in Alaska's Safe Drinking Water Regulations. Also established in the regulations are the minimum separation distances which must be provided for safety between a water supply and a wastewater disposal system.

...Water Treatment and Disinfection...

Treatment to improve the sanitary, or bacteriological, quality of water is known as disinfection. Chlorination is the method most commonly used and the one usually recommended by public health authorities. Chlorine is an effective disinfectant and oxidizing agent. In sufficient concentration in water and with adequate contact time, it will kill coliform bacteria and disease organisms, reduce some of the bad tastes and odors of decaying vegetation, and oxidize sulfur, iron, and other impurities. Boiling, pasteurizing, ultraviolet light and ozonation are other, less common, methods of disinfection.

Many water systems, particularly those using surface water as a source, use filtration as a means of treatment. Filtration can remove suspended matter and color and helps to eliminate objectionable tastes and odors. More importantly, it helps remove spores of organisms which could cause diseases, but which are not killed by disinfection. In combination with chlorination, filtration can provide complete treatment for most water supplies.

Alaskan Safe Water Problems

Answer the following questions about the material you have just read.

1) Why are most contaminants (pollutants) difficult to detect in one's drinking water?

2) Name six illnesses caused from water contaminated by disease-causing organisms.

3) How many chemical contaminants from industries, institutions or homes adversely affect human health?

4) What is the Department of Environmental Conservation's duty to Alaskans?

5) What is the most basic way of insuring that drinking water is safe?

6) How does chlorine purify drinking water?

Water Cycle

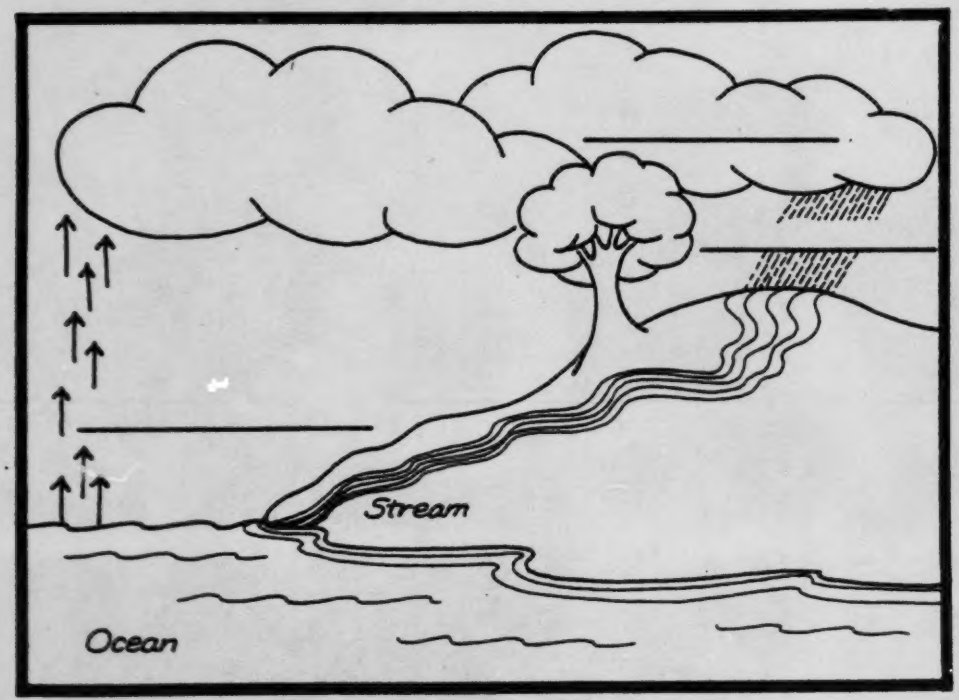
Water is our most valuable renewable resource. All life is dependent upon water for survival. Water is needed by man for industry, irrigation, recreation, etc. The freezing and thawing of water helps break rocks into smaller particles that eventually become soil. Water helps leach nutrients down in the soil so plant roots can use them. Water in the soil is used by plants to manufacture food, and wildlife needs water in order to live.

Water renews itself through the water cycle. The elements that make up the weather (heat, pressure, wind and moisture) cause precipitation, evaporation and condensation in an endless cycle.

Because of heat, water in lakes and oceans evaporates and rises into the atmosphere. Here it cools and condenses, forming clouds which are blown by the wind. When the clouds contain too much moisture, it starts to rain. As the rain falls to the ground, some of it soaks into the ground and is stored in underground streams, caverns, or in air spaces between the soil particles. The underground streams form springs when they reach the surface of the earth. Water which soaks into the earth and is stored there is called ground water.

The water that does not soak into the ground runs off into streams, lakes and the oceans. This is called surface water. Some of the surface water evaporates and returns to the air to form clouds again. Thus, the cycle repeats itself.

Some of the water that plants use is lost through the leaves by a process called transpiration. Transpiration in plants is like perspiration in people.



Water Cycle

Circle these words that make up the elements of weather and the stages of the water cycle:

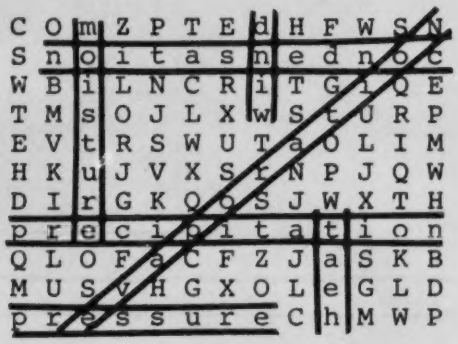
C O M Z P T E D H F W S N
S N O I T A S N E D N O C
W B I L N C R I T G I Q E
T M S O J L X W S T U R P
E V T R S W U T A O L I M
H K U J V X S R N P J Q W
D I R G K Q O S J W X T H
P R E C I P I T A T I O N
Q L O F A C F Z J A S K B
M U S V H G X O L E G L D
P R E S S U R E C H M W P

evaporation
condensation
precipitation
moisture
wind
pressure
heat

ANSWER SHEET:

Water Cycle

Circle these words that make up the elements of weather and the stages of the water cycle.


C O m Z P T E d H F W S N
S n o i t a s m e d n o c
W B i L N C R i T G i Q E
T M s O J L X w S t U R P
E V t R S W U T a O L I M
H K u J V X S r N P J Q W
D I r G K Q o S J W X T H
p r e c i p i t a t i o n
Q L O F a C F Z J a S K B
M U S v H G X O L e G L D
p r e s s u r e C h M W P

evaporation
condensation
precipitation

moisture
wind
pressure
heat

Lesson III Micro-Organisms in Water

Objective: Students will view micro-organisms and, after reading lab worksheets and completing sketches of specimens, be able to list two characteristics of the three categories of micro-organisms.

Materials:
- Microscopes (3)
- slides:
  - protozoa
  - algae
  - bacteria
- 4 student information/ drawing sheets (pp. 21-24)
- 1 micro-organism crossword puzzle (pg. 25)
- colored drawing pencils/pens
- (optional) Ak State Library Films 10334, 30028 or 34733
- 1 Disease Research Assignment (pg. 27)

Introduction: Polluting substances vary from organic (made up of or derived from living things) to inorganic (not of animal or vegetable origin) and from visible to microscopic.

This lesson uses microscopic organisms to give a concrete reference to the concept of water pollution. It should be made clear that these micro-organisms represent only one form of pollution.

Before the class observation of the microscope specimens, check the slides to verify that visual differences are defined. Arrange the microscopes and slides in stations with adequate room for the drawing. At each station have a selection of slides in only one category. This will allow an easier access to materials and minimize congestion. Depending on the group's experience with microscopes, you may have to review with them how to use the equipment.

Note: Bacteria may be difficult to view. Another method may be used.

Vocabulary Preparation:

bacteria	organic	typhoid
protozoa	algae	virus
tapeworm	cholera	hepatitis
gastroenteritis	hydatid	dysentery
organisms	pathogenic	biochemical

Lesson III Micro-Organisms in Water (con't)

Instructional Activities:

1. Briefly review the major concepts in Alaska pollution. Ask the class what careers might be part of the pollution prevention process. List on the board jobs related to the pollution prevention/water quality field. Tell the group that they will be experiencing a small part of the work on one of these jobs.

2. Complete the vocabulary, writing complete definitions. Alternately, duplicate copies of the vocabulary terms used in context. Discuss or review any questions concerning the vocabulary.

3. Distribute the student response sheets for the protozoa, algae and bacteria. Tell the students they will be expected to complete it by drawing the specimens, reading some information, and answering questions about micro-organisms which can pollute water supplies.

4. Review or demonstrate how to use the microscope. Group the class for efficient viewing of the specimens. Allow time for the students to make an overall observation of the three specimen slides. At another station the students may begin sketching the specimens. Those waiting a turn should finish reading the fact sheets and vocabulary building work. Upon completion of the first viewing by all students, and before drawing has started, discuss the differences found and clarify structures to be drawn, using the chalkboard.

5. Discuss the specimen shapes, color (pointing out that the specimens are stained before mounting to reveal structure more clearly), amount of magnification used to make them visible.

6. Allow time for the completion of the drawing response sheets.

7. Complete the "Micro-organism Crossword Puzzle."

Additional Activities:

1. Assign a research project in water-borne diseases based on those in the "Disease Research Assignment" handout. Assign each student to research one disease for a report to the class. Make certain all are covered.

BACTERIA

Draw a picture of the bacteria you have seen in the microscope.

Bacteria are one-celled organisms with a simple cell structure. They are among the smallest of all cells. They are probably the most numerous of all organisms. They can be found everywhere.

Of greatest concern to environmental scientists are those bacteria that inhabit human sewage. Human excreta in the effluents from sewage treatment plants are the greatest source of pathogenic bacteria in our waters. Pathogenic bacteria can also enter the water by leaching through the soil from cesspools and septic tanks. One might assume that these bacteria can be detected easily by analyzing water samples. This, however, is not the case. Survival of pathogenic bacteria after leaving the human body is poor, since they require body temperature and fluids to survive. Some of them do, however, remain alive for a limited period of time, although they cannot reproduce. These few survivors are very difficult to detect. The best methods are tedious and expensive. Further, pathogenic bacteria enter the water only sporadically; this increases the chances that they may escape detection. For these reasons, another method is used to indicate the presence of pathogenic bacteria.

Bacteria

Certain species of a group of bacteria called coliforms are normal inhabitants of the large intestine of man and other animals. These species are referred to as fecal coliforms. Non-fecal species are frequently found in soil and in plants. The coliforms are grouped together because of their similar biochemical reactions. The fecal coliforms have a commensal relationship with the host animal. They are provided with a suitable environment in the large intestine. They, in turn, assist the host in the breakdown of waste products of digestion. Each day billions of coliform bacteria leave the body of each human in the feces. Of these coliforms, 80-95% are commonly of the species Escherichia coli (E. coli). Thus the presence of coliform organisms, in particular E. coli, indicates pollution of the water by fecal matter. Since the feces of a diseased person could contain pathogens, the presence of E. coli indicates the possible presence of pathogens. Pathogens are hard to detect; coliforms are not. Therefore public health officials look for coliforms when they are assessing water quality. Coliforms live much longer outside the human body than do most pathogens. This fact increases their usefulness as indicators of infected water. If coliforms are not detectable in the water, it is likely free of pathogens and, therefore, fit to drink.

ALGAE

Draw a picture of the algae you have seen in the microscope.

Algae are simple organisms that live in oceans, lakes, rivers, ponds, and moist soil. All algae contain chlorophyll. They help purify the air and water by the process of photosynthesis. Some algae grow best in polluted lakes and rivers. Organic materials and nutrients dumped into fresh water or the sea by humans may cause them to multiply. The increased algae population sometimes upsets the natural balance of life in a body of water.

Algae produce their own food by photosynthesis. In most aquatic ecosystems, they are the main producers and form the first link in the food chains. They are eaten by zooplankton, which are eaten by first-order carnivores, and so on up the food chain. As a by-product of photosynthesis, algae produce oxygen. Some scientists estimate that algae are responsible for up to 80% of the oxygen production in the world. The oxygen they produce helps to purify polluted waters because it oxidizes many pollutants. It also helps to re-oxygenate water that has had its oxygen supply lowered by pollution.

Obviously algae are a normal and essential part of most aquatic ecosystems. Only in high concentrations do they harm the aquatic environment. After massive algae blooms, the decaying dead algae rob the water of its oxygen. They impart undesirable taste, odor, and appearance to the water; they foul swimming beaches; they clog filters of water purification plants.

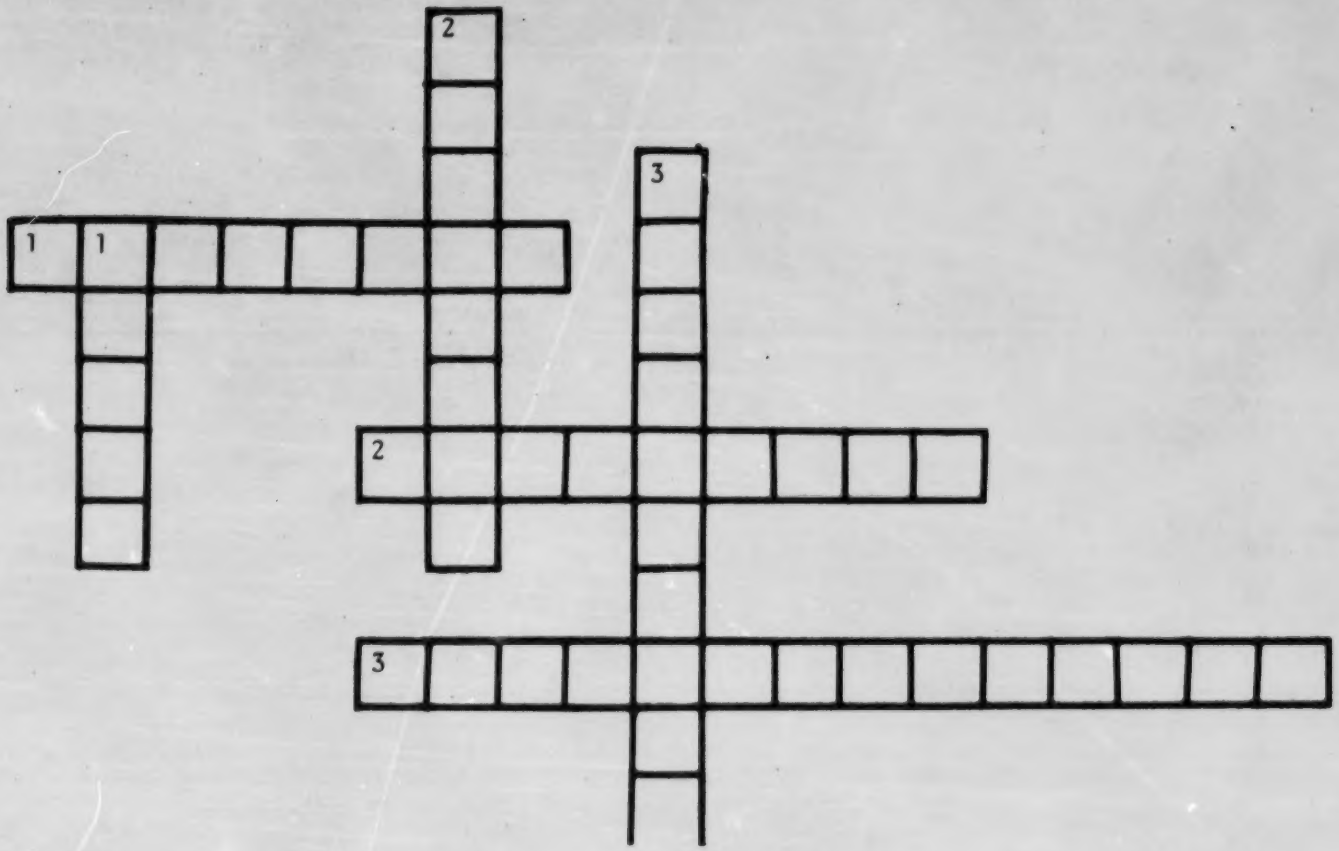
PROTOZOA

Draw a picture of the protozoa you have seen in the microscope.

Protozoans are the simplest kind of animals, and therefore the lowest group in the animal kingdom. The term protozoan comes from Greek and means first animal. There are about 20,000 kinds of protozoa, most of them so small that they can be seen only through a microscope. They feed on algae, bacteria, and particles of dead organic matter.

The members of one group of protozoa, the Sarcodina, move by the use of pseudopodo or false feet. The protoplasm simply flows in the direction of motion. The movement is slow but as the organism moves over the bottom of a pond it also feeds by engulfing organic material. The presence of Sarcodina, therefore, normally indicates the presence of organic matter and thereby provides information on levels of possible pollution.

MICROORGANISM CROSSWORD PUZZLE



ACROSS

1. the smallest microorganisms
2. simplest animal forms
3. process whereby oxygen is created

DOWN

1. simple organism containing chlorophyll
2. bacteria used as indicators of pollution
3. instrument to view microorganisms

47

46

Micro-organisms Crossword Puzzle - Answer Sheet

ACROSS

1. Bacteria
2. Protozoan
3. Photosynthesis

DOWN

1. Algae
2. Coliform
3. Microscope

DISEASE RESEARCH ASSIGNMENT

The threat and potential threat to safe drinking water in Alaska comes from various sources. Each pollutant, in the right amount and under the right conditions, will cause illness and disease in human beings. The following list of diseases can all originate from organic infestation of drinking water.

Typhoid

Paratyphoid

Cholera

Leptospirosis

Dysentery

Infectious Hepatitis

Shigellosis

Diarrhea

Impetigo

Salmonellosis

Gastroenteritis

Hydatid

Lesson IV — **Non-Living Pollutants**

Objective: Students will identify four or more pollutants, their origins and associated health hazards.

Materials:
- 1 student reading material: "Inorganic Pollution" (pp. 30-31)
- 1 student response sheet: "Inorganic Pollution" (pp. 32-33)
- encyclopedia sets (appropriate to grade level - Compton's, World Book, etc.) or health texts

Introduction: This lesson introduces and defines non-living pollutants, traces their sources, and identifies health hazards arising from such pollution. It expands the topic of Alaskan water pollution problems to include inorganic causes of pollution. There is a real danger to Alaskans from these pollutants. Explain to the students that their assignment will be to discover what non-living substances can produce water pollution, and that they will be expected to complete a table following a reading assignment. The table, "Inorganic Pollution", lends itself to easy retrieval of information for oral review and comparison to organic pollutants.

The terms organic and inorganic, as used here, do not refer to carbon base chemical composition, but to the pollutant source as being a living or non-living form.

Vocabulary Preparation:

pesticides	arsenic	lead
mercury	radioactivity	turbidity

Instructional Activities:

1. Briefly review and summarize the concept of pollution by micro-organisms. Ask the students if they know of any kind of water pollution with a cause other than living things contaminating the water. List their responses on the chalkboard and discuss. Can they recall any examples of serious chemical pollution causing possible harm to people? (Japanese cities with mercury poisoning, banning the sale of swordfish for food.)

2. Explain to the students the difference between these instances of pollution and disease caused by micro-organisms in terms of whether the

cause is a life form (organic pollution created by micro-organisms) or whether a non-living source (chemical/toxic pollution) is responsible.

3. Distribute handouts on inorganic pollutants. Allow time for all to read silently (about 20 minutes). Students who finish early may use the encyclopedia for looking up additional information on one of the inorganic pollutants, including its source and use.

4. Discuss any student questions that arise.

5. Assign "Inorganic Pollution" response sheet.

Inorganic Pollution

The following information on inorganic pollutants, their sources, and health hazards has been taken from an Environmental Protection Agency publication entitled Is Your Drinking Water Safe?

Inorganic substances in water supplies are invisible to the eye and, if not detected by water safety personnel, can cause illness and even death. Large cities and small towns can be affected. Fairbanks has had several cases of arsenic poisoning due to contaminated water supplies during the last few years. For the most part, chemical pollutants are less of a problem than organic pollutants. Nevertheless, chemical pollutants have a potential for creating a serious health hazard and must be kept from our drinking water.

Nitrate - Nitrates in drinking water pose an immediate threat to children under three months of age. In some infants, excessive levels of nitrate have been known to react with the hemoglobin in the blood to produce an anemic condition commonly known as "blue baby". If you receive notice that your drinking water contains an excessive amount of nitrate, do not give the water to infants under three months of age and do not use it to prepare formula. Do not boil the water as boiling will only increase the nitrate concentration.

Arsenic - This element occurs naturally in the environment, especially in the western United States, and it is also used in insecticides. It is found in foods, tobacco, shellfish, drinking water, and in the air in some locations.

If you continuously drink water that contains a substantial amount over a lifetime, you may suffer from fatigue and loss of energy. Extremely high levels can cause poisoning.

Barium - Although not as widespread as arsenic, this element also occurs naturally in the environment in some areas. It can also enter water supplies through industrial waste discharges.

Small doses of barium are not harmful. However, it is quite dangerous when consumed in large quantities and will bring on increased blood pressure, nerve damage and even death.

Cadmium - Only minute amounts of this element are found in natural waters in the United States. Waste discharges from the electroplating, photography, insecticide, and metallurgy industries can increase cadmium levels, however. The most common source of cadmium in our drinking water is from galvanized pipes and fixtures. But the main sources of cadmium exposure are the foods we eat and cigarette smoking.

Fluoride - This is a natural mineral and all drinking water contains some. High levels of fluoride in drinking water can cause brown spots on the teeth, or mottling, in children up to 12 years of age. Adults can tolerate ten times more than children. In the proper amounts, however, fluoride in drinking water prevents cavities

during early years. This is why many communities add fluoride in controlled amounts to their water supplies.

Lead - This metal is found in the air, water and our food. It comes from lead and galvanized pipes, auto exhausts, and other sources. Excessive amounts may result in nervous system disorders or brain or kidney damage.

Mercury - Mercury is found naturally throughout the environment. Large increases in mercury levels in water can be caused by industrial and agricultural use. The health risk from mercury is greater from mercury in fish than simply from water-borne mercury. Mercury poisoning may happen in large doses or from lower doses taken over an extended time period.

Selenium - This mineral occurs naturally in soil and plants, especially in western states. It is found in meat and other foods. Although it is believed to be essential in the diet, there are indications that large amounts of selenium may be deadly poisonous. Studies are underway to determine the amount required for good nutrition and the amount that may be harmful.

Pesticides - Millions of pounds of pesticides are used on croplands, forests, lawns and gardens in the United States each year. They drain off into surface waters or seep into underground water supplies. Many of them may pose health problems if they get into drinking water and the water is not properly treated.

Radioactivity - Radioactive contaminants may be either natural or human-caused. Natural radioactive contaminants are usually found in groundwater, while those with human sources may, on very rare occasions, appear in surface water.

Radioactivity has not yet been a significant problem in Alaska's public water systems, but radioactive wastes could accompany future industrial and energy development in the State. The health effects of exposure to radioactivity vary from minor cell damage to birth defects to cancer and death.

Turbidity - The cloudiness, or turbidity, of drinking water is also covered by the national standards. The minute particles suspended in the water that cause turbidity can interfere with disinfection and with bacteria testing. Excessive turbidity can thus allow disease-causing organisms to survive.

INORGANIC POLLUTION

From your reading material on inorganic pollution fill in the information under each heading.

(JH #4)

POLLUTANT	SOURCE	HEALTH HAZARD
1		
2		
3		
4		
5		
6		

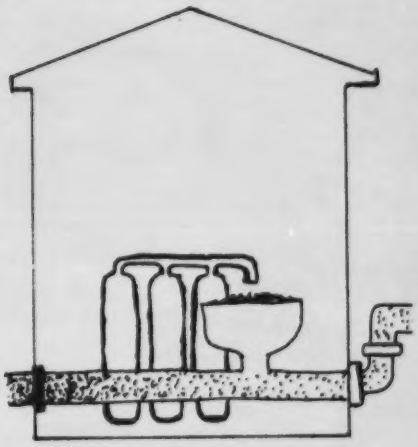
CONTINUED

INORGANIC POLLUTION ‹CONT.›

POLLUTANT	SOURCE	HEALTH HAZARD
7		
8		
9		
10		
11		
12		

Lesson V — Community Water Treatment

Objective: Following a visit to a local water treatment facility, students will demonstrate an understanding of local water treatment methods and problems by participating in a simulation exercise, to the teacher's satisfaction.



Materials:
- overhead projector
- 1 transparency master: "How Water Treatment Facilities Work" (pg. 37)
- transportation and visiting arrangements to the facility.

Introduction: The visit to the water treatment facility or water source for the community provides an opportunity to review the important concepts in water quality. By seeing the facility, students can experience how their community actually faces the problem of safe drinking water. The visit to the treatment facility and water supply provides a concrete reference on which the students can focus what they have learned.

Review with a knowledgeable person at the site of your visit the objective of the class tour. Be certain that person is oriented toward presenting information about safe water. An informed person should lead the tour and be available to answer questions.

The optional simulation game on water quality control, which may be used if the visit is not feasible for this lesson, is found in the additional activities at the end of this lesson.

Additional Activities:

1. Conduct simulations of situations related to pollution and water quality control. Students fill various roles suggested by the situation and act out their responses to the problems. Suggested situations:

   a. Because a town upriver dumps its trash and honey bucket waste on the river ice in winter, a village downriver suspects its drinking water may become contaminated after break-up. Roles to be taken include a mayor and city council for each village, the Village Corporation head, one or more state agency people - DEC, Environmental Health officer, etc. The problem centers around

the fact that the upriver town has always put its garbage on the river ice and doesn't know where else to dispose of it. The downriver town has had illness suspected of being caused by pollution.

b. A major construction project is causing silt to enter a salmon stream which is used as a water supply and a fishing area for several families. Other local people see the project in terms of new jobs and a boost to the local economy. Roles include subsistence fishermen, housewives, construction workers, and state water quality officer.

c. The tailings (rock left after ore is removed) from a gold mining operation are draining arsenic into a town's water supply. Several families have had much illness in the past few years which they believe to be caused by pollution of the town's water supply by the mine wastes. Roles include mine owners, residents, mine workers, scientist-technicians.

Vocabulary Preparation:

chlorine	sedimentation	algae
copper sulfate	contaminated	reservoir

Instructional Activities:

1. Review with the class what has been learned about the health hazards of polluted water: types of water pollution, categories of pollutants. Discuss the reasons for treating water. Ask what makes "bad" water. What makes water "good"? List good and bad qualities on the chalkboard.

2. Project the diagram of a water treatment facility. Read the diagram in sequence and trace the water from its source to a house. Pose questions based on what the students have learned about pollution sources. Will this facility effectively eliminate organic (micro-organism-caused) pollution? Will it eliminate inorganic (chemical or non-living) pollution? How do you think someone could tell if all harmful substances have been removed?

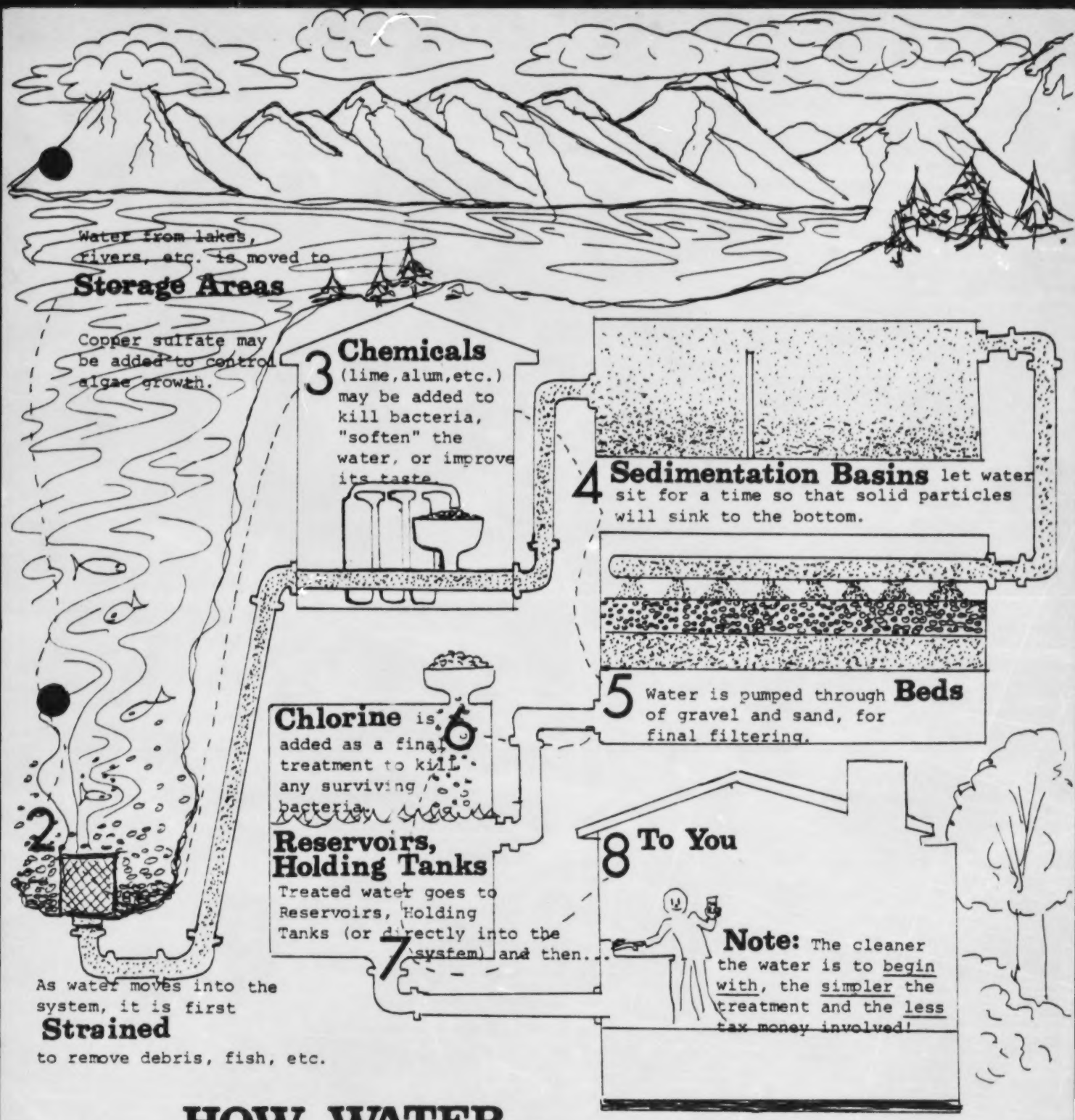
   Let the discussion turn to the local water facility. Where is it located? Who works there? What pollutants is it set up to filter out? Is anyone in the group aware of any problems with the community water supply?

3. Tell the class about the visit to the water facility - scheduled date, etc. Prepare for the visit by developing a list of class questions. Summarize these questions on the chalkboard. Allow students to generate questions. Here are some starters:

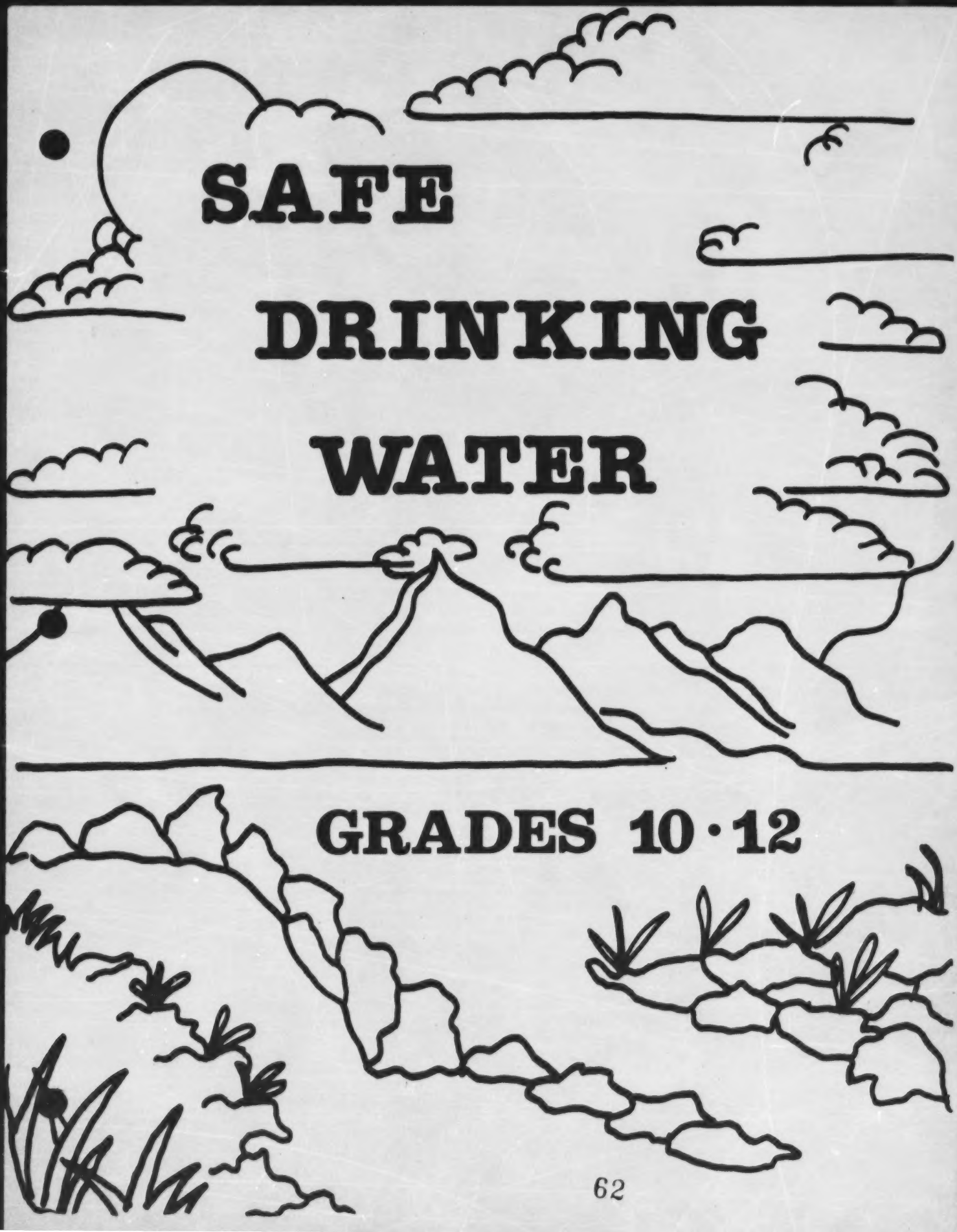
    a. How often is the water tested?
    b. What is it tested for?
    c. Have there been local outbreaks of disease traced to water problems?
    d. What pollution sources make water treatment necessary in the community?

4. Make a record of the class questions. Duplicate the list so that each student will have one to record the answers on during the visit or after returning to the classroom.

5. Make the tour of the treatment facility.


Water from lakes, rivers, etc. is moved to
Storage Areas
Copper sulfate may be added to control algae growth.
3 Chemicals (lime, alum, etc.) may be added to kill bacteria, "soften" the water, or improve its taste.
4 Sedimentation Basins let water sit for a time so that solid particles will sink to the bottom.
5 Water is pumped through Beds of gravel and sand, for final filtering.
6 Chlorine is added as a final treatment to kill any surviving bacteria.
7 Reservoirs, Holding Tanks
Treated water goes to Reservoirs, Holding Tanks (or directly into the system) and then...
8 To You
Note: The cleaner the water is to begin with, the simpler the treatment and the less tax money involved!
2
As water moves into the system, it is first
Strained
to remove debris, fish, etc.

HOW WATER TREATMENT FACILITIES WORK


SAFE
DRINKING
WATER
GRADES 10·12

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

JAY S. HAMMOND, GOVERNOR

POUCH O — JUNEAU 99811

January 29, 1980

Dear Alaskan Educator:

In a land of sparse population, abundant wildlife, clear waters and good fishing many Alaskans are lulled into thinking their drinking water is pure as the proverbial "driven snow." While there isn't a high degree of industrial pollution associated with urban development, Alaska does have very real health hazards. Localized pollution problems do exist, and often occur where they are most likely to present a threat to human health--in the communities where people live.

This curriculum material on safe drinking water in Alaska has been designed to provide students with a basic understanding of the sources of the water they drink, how drinking water can be made safe, and the health threat that unsafe water represents. The children to be presented with this unit are continuously exposed to health threats that may exist in their communities, and will one day, like their parents, have to pay the price for safe drinking water. This price is paid through user fees, treatment supply and distribution equipment, and water testing.

This curriculum is multi-disciplinary and can be approached from any of the following subject areas with little adaptation: health, science, social sciences, and government. The suggested activities include skills developed in art, English, drama, and library classes. This curriculum could be used very effectively when coordinated between classes taught in several subject areas.

We hope you find this material to be very useful in helping your students meet your own learning objectives and at the same time learn about causes and solutions to one of Alaska's significant environmental problems.

Sincerely,

Ernst W. Mueller
Commissioner

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Safe Drinking Water

Introduction:

The next five lessons have been designed to provide the student with information concerning safe drinking water and the potential threat of contamination. The series begins with a general overview of water pollution, goes on to discuss types of water treatment and pollution problems in Alaska, introduces the role state government plays in maintaining and improving water quality and concludes with students becoming directly involved with water quality problems and solutions in their community.

The first lesson has two objects. They are 1) to provide basic information on inorganic and organic water pollutants which are potential health hazards, 2) for the students to do written or oral reports on at least one water-borne illness caused by organic infestation of a drinking water source. Resource reading for the student has been included to help develop this lesson.

The second lesson introduces four types of water treatment systems and has students visit their local water treatment facility. Materials for more in-depth coverage of this subject have been included for the teacher.

Lesson three provides the students with information on statewide water resources and water-related problems in Alaska. Students should discover how diverse Alaska is and how these differences contrast to their own water treatment facility. A wall map of Alaska and carefully selected reading materials aid in this lesson.

The fourth lesson informs the students that there are three main ways the state government helps maintain and improve water quality. They are: 1) collects information, 2) sets standards (or creates laws) and 3) provides direct assistance. Through the discussions and reading materials the students will learn about how the government helps ensure water quality.

Lesson five provides an opportunity for the students to become directly involved with the water quality problems with which they live. Students will study a water quality

problem in their community and present their findings and solutions to a local, regional or state government body.

Flexibility is a prime concern in the development of these lessons. Each teacher, keeping in mind the special needs of the class and the particular resources of the area, should feel free to adapt the materials and/or sequence of these lessons.

TEACHER RESOURCE LIST

The resources listed below can be found in the Alaska State Library system.

Berthovex, P. Mac, Strategy of Pollution Control, 1977 (TD 170 .B 493

McCombs, Lawrence W., What's Ecology?, 1973 (QH 541 .M3)

Gildea, Ray Y., Arsenic and Old Lead, 1975 (TD 175 .G54)

Gofman, John William, Poisoned Power; The Case Against Nuclear Power Plants, 1971 (TK 9152 .G57)

Hynes, H.B., The Ecology of Running Waters, 1970 (QH 96 .H8 1970)

Millard, Reed, Clean Air - Clean Water For Tomorrow's World, 1971 (HC 79 .E5 M5)

Simon, Seymour, Science Projects in Ecology, 1972 (QH 541 .14 .S55)

Smith, Stephen M., Energy-Environment Mini-Unit Guide, 1975 (TJ 163.23 .E53)

Taub, Harold J., Keeping Healthy In a Polluted World, 1974 (RB 152 .T38 1974)

Lesson I — Organic and Inorganic Water Pollutants

Objective 1: After reading information on the subject of inorganic pollutants, students will be able to correctly complete all parts of a student response sheet.

Materials:
1 student reading material: "Inorganic Pollution" (pp. 45-46)
1 student response sheet: "Inorganic Pollution" (pp. 47-48)

Introduction: The intent of this lesson is to provide basic information on inorganic and organic water pollutants which are potential health hazards. This information is basic to the entire unit but may be unfamiliar to the group with which you are working.

If the subject of chemicals, in general, is unfamiliar to the students, it may be best to prepare the students by explaining the difference between inorganic and organic substances. The suggested bibliography at the end of this unit will provide a possible resource. Also, a person with background in this area might be available in the community to provide an introduction to the subject (another teacher, a health worker or a medical person).

Vocabulary Preparation:

organic	nitrate	mercury	bacteria
inorganic	arsenic	selenium	disinfection
substances	barium	pesticides	source
pollutant	cadmium	radioactivity	galvanized
potential	fluoride	turbidity	environment

Instructional Activities:

1. Ask, "What is water pollution? When is water polluted? Would you drink polluted water? How do you know when water is polluted?"

2. The discussion around the definition and identification of water pollution should lead to recognition of health-related problems associated with pollutants. New information for the students might be brought out concerning the invisibility of most pollutants because of their physical size. Also students might not be aware of the potential threat of chemical (inorganic) pollutants.

3. Inform the students that the material which they will be working with will tell them about chemical substances which are sometimes found in Alaskan drinking water supplies. They will also learn about the possible health hazards which each can cause.

4. Distribute the reading material and the response sheets which will focus the students' attention on locating the important information.

5. Allow time at the end of the lesson or in the following class period to review the new information with the students.

Objective 2: Students will be able to produce to the teacher's satisfaction a written or oral report on at least one water-borne illness caused by organic infestation of a drinking water source.

Materials: list of water-borne diseases,
Disease Research Assignment

Introduction: All of the water-borne diseases in the assignment are caused directly by one or some combination of algae, protozoa, or bacteria. A few of the names may be familiar to the students but for the most part the names may seem strange.

All of the diseases listed have occurred in Alaska. It may be possible to arrange for a health worker to give an introduction to water-borne diseases. Also, find out what problems, if any, have occurred in your community which involved water-borne diseases.

Before the assignment is begun arrange an easy access to research materials. If you feel that the school library is insufficient, contact the local health center for books and materials which the students can use.

Depending on the group, decide whether this assignment will be done individually or by small groups. Also plan for a time which the students can report back to the class on what they find.

Vocabulary Preparation:

organic	micro-organism	algae
inorganic	bacteria	
infestation	protozoa	

Lesson I — Organic and Inorganic Water Pollutants (con't)

Instructional Activities:

1. Survey the class for existing knowledge of micro-organisms (protozoa, bacteria, and algae). Do they understand that these microscopic organisms can cause illness? Have they seen them enlarged?

2. Ask, "Can you name any diseases caused by micro-organisms?"

3. Inform the class that they will be researching different types of diseases to find out what micro-organisms cause them, under what conditions the micro-organism lives, how to keep it from infecting a water supply, and how to treat the disease if it occurs.

(student response)

4. Pass out Disease Research Assignment and go over the list of names with the students. Be sure that all of the diseases are assigned.

5. Allow for a time to discuss each student's findings so that the entire class can benefit from the new information.

Additional Activities:

1. Make a wall chart so that the students can record their information directly on it, thereby providing a permanent record and a visual reinforcement. Limit the categories on the chart to easily acquired information: description, source, and health hazard.

Inorganic Pollution

Inorganic substances in water supplies are invisible to the eye and, if not detected by water safety personnel, can cause illness and even death. Large cities and small towns can be affected. Fairbanks has had several cases of arsenic poisioning due to contaminated water supplies during the last few years. For the most part, chemical pollutants are less of a problem than organic pollutants. Nevertheless, chemical pollutants have a potential for creating a serious health hazard and must be prevented from contaminating drinking water.

The following information on inorganic pollutants, their sources and health hazards, has been taken from an Environmental Protection Agency publication entitled Is Your Drinking Water Safe?

Nitrate - Nitrates in drinking water pose an immediate threat to children under three months of age. In some infants, excessive levels of nitrate have been known to react with the hemoglobin in the blood to produce an anemic condition commonly known as "blue baby". If you receive notice that your drinking water contains an excessive amount of nitrate, do not give the water to infants under three months of age and do not use it to prepare formula. Do not boil the water, as boiling will only increase the nitrate concentration.

Arsenic - This element occurs naturally in the environment, especially in the western United States, and it is also used in insecticides. It is found in foods, tobacco, shellfish, drinking water, and in the air in some locations.

If you continuously drink water that contains a substantial amount over a lifetime, you may suffer from fatigue and loss of energy. Extremely high levels can cause poisoning.

Barium - Although not as widespread as arsenic, this element also occurs naturally in the environment in some areas. It can also enter water supplies through industrial waste discharges.

Small doses of barium are not harmful. However, it is quite dangerous when consumed in large quantities and will bring on increased blood pressure, nerve damage and even death.

Cadmium - Only minute amounts of this element are found in natural waters in the United States. Waste discharges from the electroplating, photography, insecticide, and metallurgy industries can increase cadmium levels, however. The most common source of cadmium in our drinking water is from galvanized pipes and fixtures. But the main sources of cadmium exposure are the foods we eat and cigarette smoking.

Fluoride - This is a natural mineral and all drinking water contains some. High levels of fluoride in drinking water can cause brown spots on the teeth, or mottling, in children up to 12 years of age. Adults can tolerate ten times more than children. In the proper amounts, however, fluoride in drinking water prevents cavities

during early years. This is why many communities add fluoride in controlled amounts to their water supplies.

Lead - This metal is found in the air, water and our food. It comes from lead and galvanized pipes, auto exhausts, and other sources. Excessive amounts may result in nervous system disorders or brain or kidney damage.

Mercury - Mercury is found naturally throughout the environment. Large increases in mercury levels in water can be caused by industrial and agricultural use. The health risk from mercury is greater from mercury in fish than simply from water-borne mercury. Mercury poisoning may happen in large doses or from lower doses taken over an extended time period.

Selenium - This mineral occurs naturally in soil and plants, especially in western states. It is found in meat and other foods. Although it is believed to be essential in the diet, there are indications that large amounts of selenium may be deadly poisonous. Studies are underway to determine the amount required for good nutrition and the amount that may be harmful.

Pesticides - Millions of pounds of pesticides are used on croplands, forests, lawns and gardens in the United States each year. They drain off into surface waters or seep into underground water supplies. Many of them may pose health problems if they get into drinking water and the water is not properly treated.

Radioactivity - Radioactive contaminants may be either natural or human-caused. Natural radioactive contaminants are usually found in groundwater, while those caused by humans may, on very rare occasions, appear in surface water.

Radioactivity has not yet been a significant problem in Alaska's public water systems, but radioactive wastes could accompany future industrial and energy development in the State. The health effects of exposure to radioactivity vary from minor cell damage to birth defects to cancer and death.

Turbidity - The cloudiness, or turbidity, of drinking water is also covered by the national standards. The minute particles suspended in water that cause turbidity can interfere with disinfection and with bacteria testing. Excessive turbidity can thus allow disease-causing organisms to survive.

INORGANIC POLLUTION

From your reading material on inorganic pollution, fill in the information under each heading.

(HS #4)

POLLUTANT	SOURCE	HEALTH HAZARD
1		
2		
3		
4		
5		
6		

INORGANIC POLLUTION ‹CONT.›

POLLUTANT	SOURCE	HEALTH HAZARD
7		
8		
9		
10		
11		
12		

Lesson II — Water Treatment

Objective: Students will be able to describe in written form the method of water treatment in their community following the presentation of reading material on four water treatment systems and a field trip to their community water treatment facility.

Materials:
- 1 student reading material: "Water Treatment" (pp. 52-53)
- 1 teacher background material: "Water Treatment" (pp. 54-58) - taken from: Safe Drinking Water for Alaskans, Dept. of Environmental Conservation
- arrangements for visiting local water treatment facility
- glass of dirty looking water

Introduction: There are many ways to treat water which both ensure its safety and make it more acceptable for human use. This lesson introduces four types of water treatment systems and suggests that the students use their information through an examination of their community water treatment system. More in-depth coverage is provided as teacher information than is presented to the students. This subject will undoubtedly be new to the students and several questions may arise. If it is possible, have someone familiar with water treatment available to answer questions or to present an introductory lesson.

Vocabulary Preparation:

purify	concentrations	cancer
bacteria	minerals	genetic
viruses	organisms	mutation
contaminants	degraded	chlorination
contaminate	suspicion	diatomaceous
porous	ceramic	porcelain
substances	iron	manganese
calcium	magnesium	sulfur

Instructional Activities:

1. Inquire whether the students know about how their water is treated to ensure its safety. Hold a glass of obviously dirty water up for the class to see. Ask if anyone would like to drink it. Ask for ideas of how to make the water acceptable for drinking.

2. Inform the students that the reading material which they are to study will tell them about

four different types of water treatment systems and the reasons for treatment systems.

3. Distribute the reading material and have the class read it in a manner which best focuses their attention.

4. Ask, "Why should people be concerned with water treatment systems?"

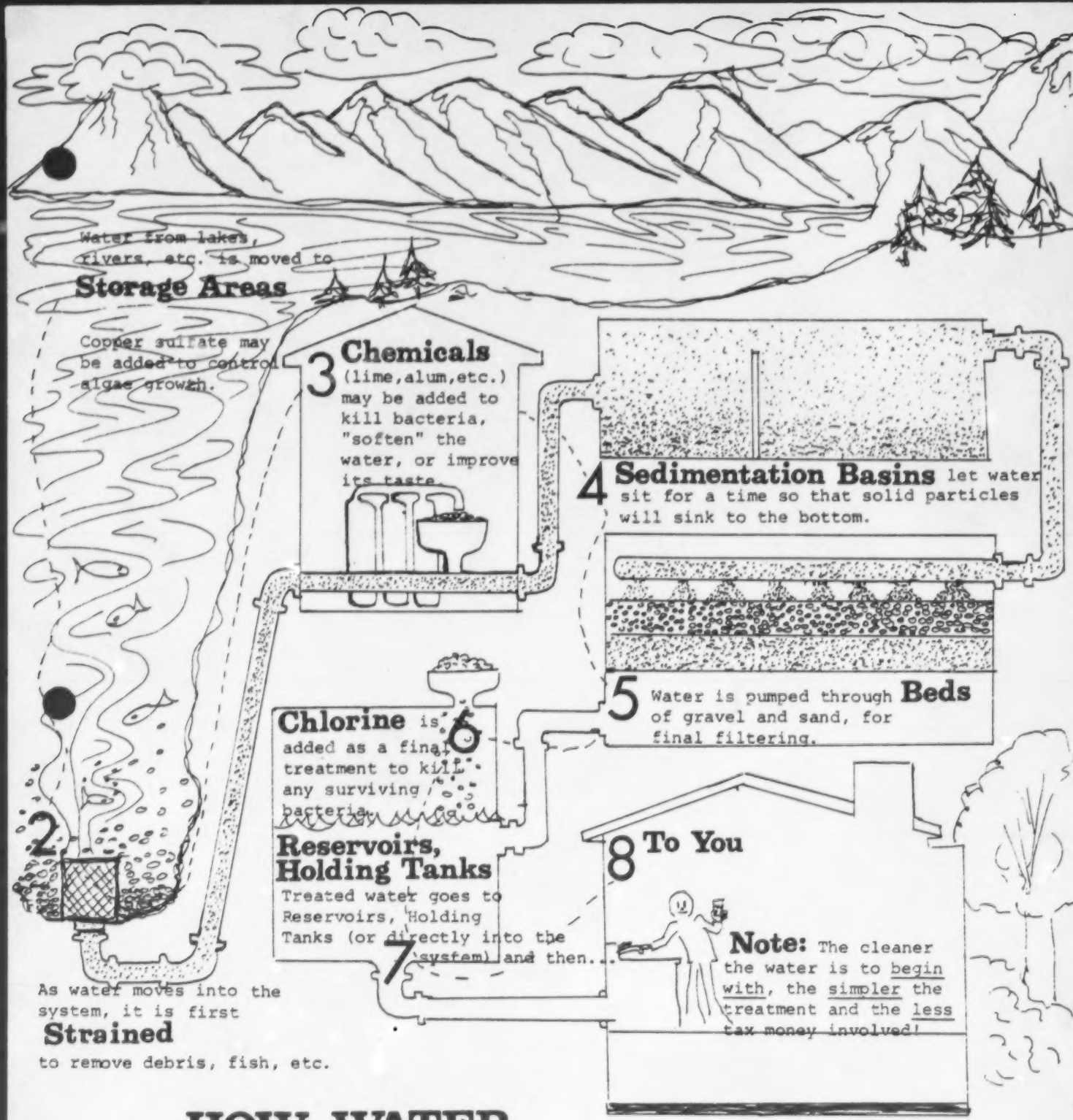
5. Ask, "Which of the four treatments would be most effective in killing micro-organisms? Which of the four would be effective in eliminating bad tastes or odors? Which of the four systems would be effective in removing mud and dirt?"

6. Ask, "Which of these systems or combination of systems is the community using?"

(field trip) 7. Arrange for a visit to the local water treatment facility. Have someone available to provide a tour of the treatment system and to answer questions which may be decided upon in a class session prior to the trip.

(student response) 8. Upon returning to class, instruct the students to briefly write an account of their visit, noting what type of water system (of the four they read about) the community uses. Also explain why the community needs a water treatment facility.

Additional Activities: If no water treatment facility exists, create a lesson around choosing one to meet the needs of the community.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Copper sulfate may be added to control algae growth.
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4 Sedimentation Basins let water sit for a time so that solid particles will sink to the bottom.
5 Water is pumped through Beds of gravel and sand, for final filtering.
6 Chlorine is added as a final treatment to kill any surviving bacteria.
7 Reservoirs, Holding Tanks
Treated water goes to Reservoirs, Holding Tanks (or directly into the system) and then...
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Note: The cleaner the water is to begin with, the simpler the treatment and the less tax money involved!
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As water moves into the system, it is first
Strained
to remove debris, fish, etc.

HOW WATER TREATMENT FACILITIES WORK

Water Treatment

Most Alaskans take the purity of their drinking water for granted. Few of us think twice before filling a glass, whether from city supply, basement well, or campsite creek. Unless water looks or tastes "bad", we don't question that it is safe to drink. However, most drinking water contaminants cannot be seen or tasted. Bacteria, viruses, inorganic and organic chemicals all can lead to chronic or acute water-borne diseases.

Alaskans are fortunate to live in an environment which is largely uncontaminated by humans. This does not mean, however, that we shouldn't be concerned about our drinking water. Even in unpopulated areas, water from ponds, streams and other surface sources can be contaminated by animal wastes or chemicals from natural sources. Water from springs and wells is less likely to be polluted, but may contain high concentrations of dissolved minerals or gases. The following are possible drinking water problems of which we, as Alaskans, should be aware:

Water, as obtained from natural sources, may be contaminated by disease-causing organisms which make it unsafe to drink. Germ-laden water can cause infections of the intestinal tract such as salmonellosis, cholera, gastroenteritis and dysentery. Other serious illnesses often caused by contaminated drinking water are typhoid fever, infectious hepatitis, and hydatid disease, a fatal condition caused by ingesting tapeworm eggs sometimes found in the feces of dogs, wolves, coyotes and foxes.

Chemical contaminants in drinking water may also adversely affect human health. In some cases, medical science has yet to determine the exact effects on humans of long-term, low-level exposure to these chemicals. We do know, however, that water supplies, particularly surface waters, are being degraded by the use of chemical compounds in agriculture, industry, institutions and homes. Industry uses hundreds of thousands of potentially poisonous chemicals, and many hundreds of new chemicals are developed each year which can contaminate both surface and ground waters. There is suspicion that cancer, genetic mutation, and birth deformities are related to many of the chemicals found in water.

Some Alaskan drinking water naturally contains large amounts of chemicals such as nitrate, which can cause a condition in infants similar to "blue baby", and arsenic, which can cause chronic toxicity. Water may be high in calcium and magnesium which make it undesirable for laundering, bathing or cooking. Some water may be acceptable from a health standpoint, but may be objectionable because of odor or taste.

Protection of the water source is the most basic method of insuring that your water stays safe and pure. The watersheds from which ground and surface water flow must be protected from contamination. Discharge of wastewater, solid wastes and other contaminants must be carefully controlled in these areas.

There are four major ways of treating water to ensure that it is safe for drinking and that all unwanted tastes and odors are removed. These four water treatment processes are explained below.

Chlorination -

Treatment to improve the sanitary, or bacteriological, quality of water is know as disinfection. Chlorination is the method most commonly used and the one usually recommended by public health workers. Chlorine is an effective disinfectant and oxidizing agent. In sufficient concentration in water and with enough contact time, it will kill coliform bacteria and disease organisms, reduce some of the bad tastes and odors of decaying vegetation, and oxidize sulfur, iron, and other chemicals in the water.

Filtration -

Many water systems, especially those using surface water as a source, use filtration as a means of treatment. Filtration is the process of removing suspended matter from water as it passes through filters. Since bacteria can travel long distances through filtering materials, filters should not be relied upon to produce safe water free from bacteria. Some common materials used to make filters are sand, diatomaceous earth, porous stone, ceramic or unglazed porcelain. In combination with chlorination, filtration can provide complete treatment for most water supples.

Sedimentation -

This process of cleaning water allows the water to sit still for at least 24 hours while gravity's settling action reduces the heavy suspended material. The settling action can take place in a quiet pond or a specially built tank.

Conditioning -

Conditioning is a term used when water treatment workers speak about changing the quality of water to make it more acceptable. Sometimes water may naturally have chemicals, bacteria or decaying vegetable substances which damage water systems or create unwanted tastes and odors. This happens when excess amounts of iron, manganese, calcium, magnesium, sulfur, iron bacteria, or small organisms are present, or if it is necessary to control or prevent corrosion. In these cases, although there is no health hazard, special filters and processes are needed to condition the water, making it fit for human use.

Teacher Background Material -
Water Treatment

The following information will provide more substantive background information than is presented to the students. This has been taken directly from a 1974 U.S. Environmental Protection Agency publication entitled Manual of Individual Water Supply Systems.

NEED AND PURPOSE

Raw waters obtained from natural sources may not be completely satisfactory for domestic use. Surface waters may contain pathogenic (disease-producing) organisms, suspended matter or organic substances. Except in limestone areas, ground water is less likely to have pathogenic organisms than surface water, but may contain undesirable tastes and odors or mineral impurities limiting its use or acceptability. Some of these objectionable characteristics may be tolerated temporarily, but it is desirable to raise the quality of the water to the highest possible level by suitable treatment. In those instances where the nearly ideal water can be developed from a source, it is still advisable to provide the necessary equipment for treatment to insure safe water at all times.

The quality of surface water constantly changes. Natural processes which affect water quality are the dissolving of minerals, sedimentation, filtration, aeration, sunlight, and biochemical decomposition. Natural processes may tend to pollute and contaminate or to purify the water; however, the natural processes of purification are not consistent or reliable.

Bacteria which are numerous in waters at or near the earth's surface may be reduced by soil filtration, depletion of available oxygen, or underground detention for long periods under conditions unfavorable for bacterial growth or survival. When water flows through underground fissures or channels, however, it may retain contamination over long distances and for extended periods of time.

The false belief that flowing water purifies itself after traveling various distances has led to unjustified feelings of security about its safety. Under certain conditions the number of micro-organisms in flowing surface water may increase instead of decrease.

Water treatment incorporates, modifies, or supplements certain natural processes. This provides adequate assurance that the water is free from pathogenic organisms or other undesirable materials or chemicals. Water treatment may condition or reduce to acceptable levels any chemicals or aesthetically objectionable impurities which may be present in the water.

Some of the natural treatment processes and human-caused adaptations to improve and condition water are discussed in the following sections.

SEDIMENTATION

Sedimentation is a process of gravity settling and depositing comparatively heavy suspended materials in water.

This settling action can be accomplished in a quiescent pond or properly constructed tank or basin. At least 24 hours' detention time must be provided if a significant reduction in suspended matter is to be accomplished. The inlet of the tank should be arranged so that the incoming water containing suspended matter is distributed uniformly across the entire width as the water flows to the outlet located at the opposite end. Baffles are usually constructed to reduce high local velocities and short-circuiting of the water. The cleaning and repairing of an installation can be facilitated by the use of a tank designed with two separated sections, each of which may be used independently.

FILTRATION

Filtration is the process of removing suspended matter from water as it passes through beds of porous material. The degree of removal depends on the character and size of the filter media, the thickness of the porous media, and the size and quantity of the suspended solids. Since bacteria can travel long distances through granular materials, filters should not be relied upon to produce bacteriologically safe water, even though they may greatly improve the quality. When a water source contains a large amount of turbidity, a large portion of it can first be removed by sedimentation. A protected pond with gentle grassy slopes is often helpful in producing a reasonably clear raw water. This action will reduce the load placed on the filters.

Types of filters that may be used include:

Slow Sand Filters. Water passes slowly through beds of fine sand at rates averaging 0.05 gallon per minute per square foot of filter area.

Pressure Sand Filters. Water is applied at a rate at or above 2 gallons per minute per square foot of filter area with provisions made for frequent backwashing of the filters.

Diatomaceous Earth Filters. Suspended solids are removed by passing the water through a layer of diatomaceous filter media supported by a rigid base septum at rates approximately that of pressure sand filters.

Porous Stone, Ceramic, or Unglazed Porcelain Filters (pasteur filters). These are small household filters that are attached to faucets.

DISINFECTION

The most important water treatment process is disinfection. Disinfection is necessary to destroy all pathogenic bacteria and

other harmful organisms that may be present in water. If complete destruction of these organisms is to be accomplished, the water to which the disinfectant is added must be low in turbidity. After disinfection, water must be kept in suitable tanks or other storage facilities to prevent recontamination.

Chemical Disinfection

The desirable properties for a chemical disinfectant are high germicidal power, stability, solubility, nontoxicity to people or animals, economy, dependability, residual effect, ease of use and measurement, and availability.

Compounds of chlorine most satisfactorily comply with the desirable properties of a chemical disinfectant; and as a result, chlorine is the most commonly used water disinfectant.

Other Methods and Materials for Water Disinfection

A number of other materials and methods are used for disinfecting water. Some of these are as follows:

1. Organic chlorine-yielding compounds
2. Bromine
3. Iodine and iodine-yielding organics
4. Ozone
5. Hydrogen peroxide and peroxide-generating compounds
6. Silver
7. Nontoxic organic acids
8. Lime and mild alkaline agents
9. Ultrasonic cavitation
10. Heat treatment

Some of these are old processes on which detailed studies have been made; others are relatively new.

When a question of specific application arises, the recommendations of the State or local health department should be followed.

CONDITIONING

Iron and/or Manganese

The presence of iron and/or manganese in water creates a problem common to many individual water supply systems. When both are present beyond applicable drinking water standards, special attention should be given. Their removal or elimination depends somewhat on type and quantity, and this influences the procedure and possibly the equipment to be used.

Well water is usually clear and colorless when drawn from the faucet or tap. When water containing colorless, dissolved iron is allowed to stand in a cooking container or comes in contact with a sink or bathtub, the iron combines with oxygen from the air to form a reddish-brown precipitate commonly called rust. Manganese acts in a similar manner, but forms a brownish-black precipitate.

Iron Bacteria

Under certain conditions, the removal of iron compounds from a water supply may be complicated by the presence of iron bacteria. When dissolved iron and oxygen are present in the water, these bacteria derive the energy they need for their life processes from the oxidation of the iron to its insoluble form. These products accumulate within a gelatinous mass which coats submerged surfaces. A slimy, rust-colored mass on the interior surface of flush tanks or water closets indicates the presence of iron bacteria.

Iron bacteria can reduce the carrying capacity of water pipes by increasing frictional losses. They may impart an unpleasant taste and odor to the water or discolor and spot fabrics and plumbing fixtures, and clog pumps. A detectable slime also builds up on any surface with which the water containing these organisms comes in contact. Iron bacteria may be concentrated in a specific location and may periodically break loose and appear at the faucet in detectable amounts of rust.

Softening

Water softening is a process for the removal of the minerals, primarily calcium and magnesium, which cause hardness.

Softening of hard water is desirable if:

1. Large quantities of soap are needed to produce a lather.
2. Hard scale is formed on cooking utensils or laundry basins.
3. Hard, chalklike formations coat the interiors of piping or water tanks.
4. Heat transfer efficiency through the walls of the heating element or exchange unit of the water tank is reduced.

Tastes and Odors

Tastes and odors present in an individual water supply system fall into two general classes - natural and human-caused. Some natural causes may be traced to the presence of, or contact of water with, algae, leaves, grass, decaying vegetation, dissolved gases and slime-forming organisms. Some of the human-caused sources of taste and odor may be attributed to the presence of chemicals or sewage.

Water having a "rotten egg" odor indicates the presence of hydrogen sulfide and is commonly referred to as sulfur water. In addition to its objectionable odor, sulfur water may cause a black stain on plumbing fixtures. Hydrogen sulfide is very corrosive to common metals and will react with iron, copper or silver to form the sulfides of these metals.

Depending upon the cause, taste and odor can be removed or reduced by aeration or by treatment with activated carbon, copper sulfate, or an oxidizing agent such as chlorine.

Corrosion Control

The control of corrosion is important not only to continuous and efficient operation of the individual water system but also to delivery of properly conditioned water that has not picked up trace quantities of metals that may be hazardous to health. Whenever corrosion is minimized there is an appreciable reduction in the maintenance and possible replacement of water pipes, water heaters, or other metallic appurtenances of the system.

Nuisance Organisms

Organisms that have been known to cause problems in water supplies include several species of algae, protozoa, and diatoms that produce tastes and odors and clog filters. Iron bacteria plug water well intakes and clog pipes in distribution systems. Still other nuisance organisms are copepods, whose eggs pass through filters; midge larvae or bloodworms; and snails and mollusca. These organisms vary in complexity and size. They are uncommon or absent in ground water, but are common in surface waters.

Lesson III Alaska's Water Sources and Problems

Objective: Using information supplied from pages of Village Sanitation in Alaska and Alaska Water Assessment Summary Report, 1977, students will produce a written report on the quality of water resources in an assigned region to the teacher's satisfaction.

Materials: Classroom wall map of Alaska, reproduced on blank paper (possibly butcher paper or railroad board)
reading materials from Village Sanitation in Alaska and Alaska Water Assessment Summary Report, 1977 (pp. 62-167)

Introduction: This lesson will provide quick and easy access to water quality information for each of the 12 regional areas in Alaska. Statewide water resources and water-related problems are very diverse. Students should discover how these differences contrast to their own area.

The largest cities are not covered in these materials and, if they are chosen as topics of study, letters may be written to the municipal sanitation or environmental services departments for information. This might provide an interesting special project for a student or a small group. They could compare a small rural community to a large urban community to discover similarities and differences.

The reading materials which are supplied represent two categories of information. The first is a general overview of water conditions in a regional area. The second category of information reports on specific water conditions of selected towns and villages within each region. The materials are organized by regions, with information on small population areas in that region immediately following.

The wall chart should be used on which to record the students' information. By recording information directly onto the map, it can be used as a special

motivator. Also, when the chart is complete, it will act as a visual reinforcement for the concepts the students should be learning.

Vocabulary Preparation: There may be many new words in each of the reading sections. It may be necessary to preview each of the sections noting words which might be difficult for the students and plan a preparatory lesson before the research assignment is begun.

Instructional Activities:

1. Prior to beginning, prepare the Alaskan-shaped wall chart (a good project for students). They can trace, free-hand sketch, or use an overhead projector to produce the wall chart.

2. Survey the class for what they know about water supplies in their own region. Ask, "Where does our water come from? What problems do people in our region have with water?"

3. From having preread the information sheets on other regions in Alaska, ask similar questions about contrasting regions. Without providing all the information, develop an awareness of differences, contrasts, and similarities which the students can research.

4. Inform the students that they will be studying the twelve water regions in Alaska. They will be looking for information on each of the twelve regions. They will be expected to find:
   a. population
   b. how available water is
   c. what problems with availability exist
   d. how water is used
   e. water quality
      1) health hazards
      2) problems of pollution

5. Inform the students that they will be expected to find the information, write it neatly on the wall chart in the proper region, and make a short oral statement about water quality to the class.

6. The second aspect of this lesson is a more in-depth investigation of each region. Give the student or students who examined a particular region the pages of information on population areas in those regions. Ask for an oral report to be made on the following:

a. town and population
b. type of water supply
c. problems with water supply
d. type of waste disposal
e. problems with waste disposal

Area: 42,000 square miles

Estimated Population: 50,900

Climate: Maritime.
Average July temperature: Low 40's to high 60's.
Average January temperature: Low 20's to low 40's.
Annual Precipitation: 80 to 200 inches.

Principle Resources: Fish and wildlife, including shellfish and sea mammals, timber, minerals.

Major Sectors of the Economy: Government, forest products, fishing, tourism.

The Southeast area stretches nearly 600 miles along the border of British Columbia from Cape Dixon in the south to Cape Fairweather in the north. The Coastal Mountains, rising sharply from the water's edge, form the mainland and the 1100 islands of the Alexander Archipelago. This is a scenic area of fiords and steep-walled valleys, of slow moving glaciers and barren icefields, of high mountain lakes, streams, and waterfalls. Abundant fish and wildlife are found here.

The area contains about 14 percent of the State's population and has several of the State's centers of population, as well as many small villages. Community development is often limited by steep terrain. Roads are few, and the Alaska Marine Highway System and air transportation provide access to and within the area.

Government--Federal, State, and local--is the major employer in Southeast. Next to government, timber-based industry is the principle economic mainstay of the area. Fishing is next in economic importance although catches have declined in recent years. Tourism and recreation are also major components of the economy. Many inhabitants of small towns and villages enjoy a subsistence livelihood. Moderate economic growth is anticipated for this area.

Conclusions

The major problems found in this area include:

1. Water availability.

   Both domestic and industrial water users are increasing, placing a strain on the poor distribution systems and inadequate volume of water storage facilities. Very little cheap water storage is available due to the terrain.

   The need to solve winter freeze-ups and summer drought water supply problems will become more severe in most communities.

2. Water quality.

   Water quality degradation has been and remains a problem. The forest products industry has resulted in cases of sediment, chemical (pulp mill effluent), and water temperature pollution. Sediment, chemical, and thermal pollution from point-sources could occur from future mining in Southeast Alaska. Sea food processors and communities have, in the past, dumped their wastes into saltwaters. This is less true today, but effective alternatives have not always been worked out.

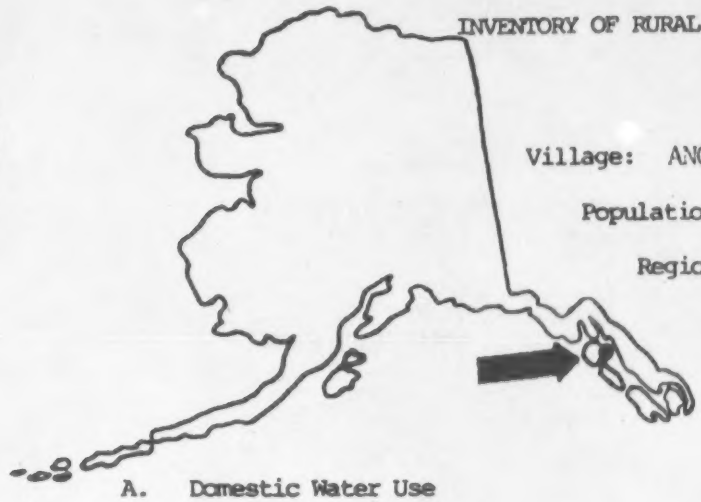
3. Energy.

   Southeast Alaska currently uses a great percent of the hydro power produced in the State. Very little of the potential has been developed. Most potential projects are seen as costly to develop, small in size, and located at some distance from the users with costly transmission lines.

4. Water use.

   Pending State and Native land selections and resultant uses will change the use and care of the area's related water resources. This is true for lands that may be developed for timber, mineral, or tourist values.

   Competitive demands of timber, fishing, mining, recreation-tourism industries, and of growing communities themselves produce conflicts over management of related water resources.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: ANGOON

Population: 530 Class: 2ND

Region: SEALASKA CORP.

Number of Homes: 84

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: CREEK/RESERVOIR/ WATER 100,000 GALLON STORAGE TANK/ FILTRATION/CL/FL/BURIED PIPES/ SERVICE TO THE HOMES

Adequacy of Present Supply: GOOD QUALITY/TRANSMISSION LINES SUFFERING EXCESSIVE HEAD LOSS/COMMUNITY IS GROWING AND SUPPLY MUST KEEP PACE WITH GROWTH/2" LINE IS INADEQUATE/ TRANSITE PIPE BREAKS, FREEZES AND LEAKS/RAW WATER QUALITY IS Fe .2 ppm/ TDS 108 ppm/HARDNESS 110 ppm

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: SUBMARINE PORTION OF TRANSMISSION LINE WAS DAMAGED BY TIDAL CURRENTS/RESTRICTION DEVELOPED IN SUBMARINE LINE IN 1975 CAUSING LOWER FLOW FROM RESERVIOR/SEVERAL LEAKS NOTED IN TRANSMISSION LINE WERE CORRECTED

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
ALL ON COMMUNITY SUPPLY EXCEPT HOTEL WHICH USES OWN WELL		SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): LAND FILL COVERED IRREGULARLY/LAND FILL VISIBLE FROM ROAD

B. Domestic Sewage Disposal Method(s): NEW BIO DISC TREATMENT BUILT IN 1978

C. History of Waste Disposal Projects: EXISTING GRAVITY FLOW SEWER SYSTEM INSTALLED IN 1966/EXTENSIONS ADDED 1974 & 1975/CONSTRUCTION 1976-1977

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	COMMUNITY SYSTEM
CLINIC	" "
JAIL	" "
HOTEL	" "
HOTEL	SEPTIC TANK
STORE	COMMUNITY SYSTEM

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL/LOCAL TSUNAMI
TELESISMIC TSUNAMI

Frequency: UNKNOWN

Severity: UNKNOWN

B. Erosion

Type of Erosion: SOME EROSION TAKING PLACE ON THE WEST SIDE OF TOWN ON THE BEACH NEAR THE SCHOOL

Severity: NOT TOO BAD

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: PEOPLE MOVE TO FISH CANNERY IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: THREA 1-300 kw/1-175 kw/1-100 kw GENERATORS/ $.27 kwh WITH $16.20 MONTHLY MINIMUM

Fuels Available and Costs: NO DATA

D. Type of Commercial Transportation: CHARTER PLANE FROM SITKA OR JUNEAU

E. Economic Factors:

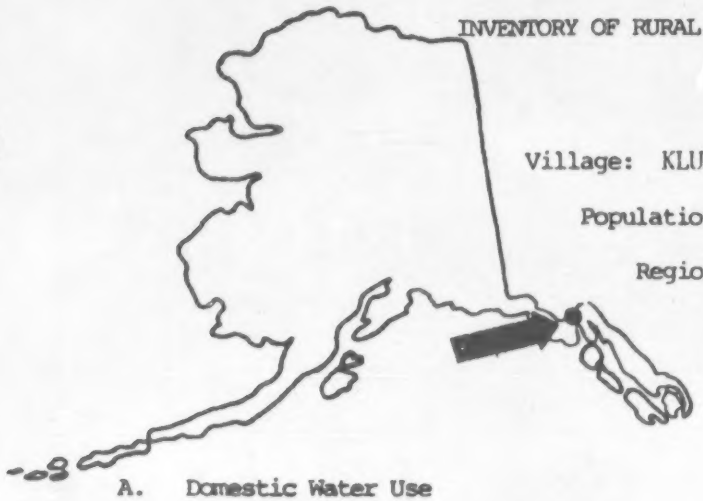
Sources of Village Revenue: 2% SALES TAX/STATE REVENUE SHARING

Personal Income (per capita): $552

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: KLUKWAN

Population: 150 Class: UNINCORPORATED

Region: SEALASKA CORPORATION

Number of Homes: 55

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: DAM ON CREEK/RESERVOIR WOOD STORAGE TANK/PIPED SERVICE TO ALL HOMES/CL/FL NOT IN OPERATION

Adequacy of Present Supply: VERY GOOD QUALITY WATER Fe 0.0 ppm/ TDS 76 ppm/HARDNESS 77 ppm

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: CHRONIC PROBLEMS WITH LINES LEAKING/ 1978 PHS REHABILITATE SOURCE AND PUMP HOUSE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SUPPLY	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): VILLAGE RESIDENTS USE OPEN DUMP IN BORROW PIT SITE

B. Domestic Sewage Disposal Method(s): FOUR SEPTIC TANKS AND DRAIN FIELDS

C. History of Waste Disposal Projects: SEPTIC TANK WASTE IS SURFACING

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEPTIC TANK

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: STREAM OVERFLOW/GLACIATION FLOODING POSSIBLE

Frequency: 5-20 YEARS

Severity: 10%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: NO DATA

Fuels Available and Costs: NO DATA

D. Type of Commercial Transportation: HIGHWAY

E. Economic Factors:

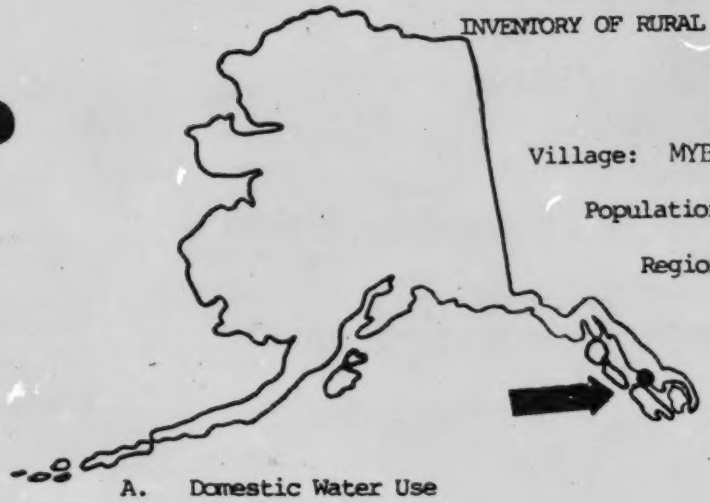
Sources of Village Revenue: NO DATA

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NO DATA



INVENTORY OF RURAL SANITATION SERVICES

MARCH / 1977
Month Year

Village: MYERS CHUCK

Population: 50 Class: UNINCORPORATED

Region: SEALASKA CORPORATION

Number of Homes: 20

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: INDIVIDUAL WELLS/MUD LAKE/3" PIPE FROM SWIMMING POOL STORAGE TANK/PIPED SERVICE TO 20 HOMES

Adequacy of Present Supply: STORAGE TANK IS UNCOVERED AND SUSEPTIBLE TO CONTAMINATION BY BIRDS/UNTREATED SOURCE OF SUPPLY

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: PIPED SYSTEM CONSTRCUCTED IN 1974 BY VILLAGE OF MYERS CHUCK

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
LIQUOR STORE	MUD LAKE	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): DUMPED INTO OCEAN OR ON BEACH AND BURNED

B. Domestic Sewage Disposal Method(s): INDIVIDUAL SEPTIC TANKS DISCHARGE TO SEA/PRIVIES

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
NONE	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/LOCAL TSUNAMI

Frequency: MINIMAL

Severity:

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: SUMMER INFLUX OF FISHERMEN

C. Power & Fuel:

Source(s) & Costs of Electricity: INDIVIDUAL GENERATORS

Fuels Available and Costs: GASOLINE $.75 GALLON

D. Type of Commercial Transportation: AIR & BOAT SERVICE

E. Economic Factors:

Sources of Village Revenue: NO DATA

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: ELEMENTARY SCHOOL MAY BE BUILT IN 1979-80

GULF OF ALASKA
AREA

Area: 34,000 square miles

Estimated Population: 11,600

Climate: Maritime and transition.
Average July temperature: Low 40's to low 70's.
Average January temperature: Low 20's to mid 40's.
Annual Precipitation: 10 to 180 inches.

Principle Resources: Fish and wildlife, including shellfish and sea mammals, timber, minerals, oil and gas.

Major Sectors of the Economy: Oil, fishing, seafood processing, government, trades.

This area is found in Southcentral Alaska and lies east of the Cook Inlet area. Principle physiographic areas include parts of the Alaska Range draining into the Gulf of Alaska, an intermontaine basin formed by the Gulkana upland and the Copper River lowland, the Wrangell Mountains, Kenai-Chugach Mountains, Prince William Sound, and the Gulf of Alaska coastal section.

Construction of the Trans-Alaska Oil Pipeline has had a significant effect on this problem area. The pipeline terminal is located at Valdez, and for about a two year period a large number of new jobs were added to the economy with a concomitant increase in the area's population. Continued growth in population and all major segments of the economy is anticipated for this area.

Conclusions

The population of this region grew rapidly with construction of the Alaska oil pipeline, pump station and terminal facilities. The State expects continued growth as a result of petroleum transport activity, supplemented by exploration for oil and gas in the Gulf of Alaska. Additional elements of growth will come from expected development activities on Native village and corporation lands.

Problems identified here include:

1. Water availability.

   Water shortages for municipalities (Valdez), for fish processing (Cordova), for placer mining, for livestock (Kenney Lake), and for maintaining minimum flows (Chistochina and Nizina areas).

   Lack of data on location and quantity of potable groundwater aquifers and of water supply (including snow pack). Areas of flood hazard, erosion, and sedimentation hazard.

2. Water quality.

   Surface water with heavy sediment loads, flood hazards (the Bering River, Valdez River, and tributaries of the Copper River), saline groundwater (interior area), and potential pollution from marine traffic and offshore oil production.

   Urban encroachment in wetlands, farm lands, flood plains, sensitive geologic and biological areas, and municipal watershed lands. Inadequate solid and liquid waste disposal systems. Overuse of public areas (Gulkana River) and lack of public facilities.

   Potential degradation of water from placer mining, sand and gravel extraction, forestry, agricultural land use, and from drilling rigs and mine processing plants.

3. Water use.

   Resource use conflicts between fisheries and oil development and production, between recreation fishing and commercial fishing, between logging and fisheries-hunting-recreation values.

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: PORT GRAHAM

Population: 197 Class: UNINCORPORATED

Region: CHUGACH INC.

Number of Homes: 40

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS SURFACE SOURCE/ 75,000 GALLON RESERVIOR/3,000 GALLON STORAGE TANK/BURIED PIPED SERVICE TO HOMES/CL/FL NOT WORKING

Adequacy of Present Supply: AMOUNT IS NOT SUFFICIENT/CANNERY DEPLETES SUPPLY/GOOD QUALITY YEAR ROUND/Fe .01 ppm/HARDNESS 29 ppm/ TDS 96 ppm

Planned Improvements in Water Supply: PHS WILL DEVELOP NEW WATER SOURCE IN 1979 TO SERVICE ASHA HOUSES

History of Water Supply Projects: DURING THE WINTER THERE IS LITTLE WATER IN RESERVIOR/5 NEW HOMES BUILT AT A HIGHER ELEVATION AND SUFFER FROM LOW WATER PRESSURE/GOOD O & M BY VILLAGE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	WELL AT SCHOOL	
CANNERY	COMMUNITY SUPPLY	
STORE	COMMUNITY SUPPLY	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): FAA CLOSED DUMP AT END OF RUNWAY/ TEMPORARY DUMP AT EAST END OF VILLAGE

B. Domestic Sewage Disposal Method(s): 3 SEPTIC TANKS FOR VILLAGE TO LEACH FIELDS ON BEACH

C. History of Waste Disposal Projects: ONE SEPTIC TANK CAUSES PROBLEMS AND MUST BE PUMPED EVERY WEEK

D. Planned Improvements in Waste Disposal: NONE IN IMMEDIATE FUTURE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEPTIC TANK
CANNERY	
STORE	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL/LOCAL TSUNAMI
TELESEISMIC TSUNAMI

Frequency: 5-20 YEARS

Severity: 10%

B. Erosion

Type of Erosion: SPRING RUNOFF

Severity: SCHOOL AREA THREATENED

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: IN MIGRATION FOR CANNERY WORK

C. Power & Fuel:

Source(s) & Costs of Electricity: HOMER ELECTRIC

Fuels Available and Costs: NO DATA

D. Types of Commercial Transportation: COMMERCIAL AIR

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NO DATA

Area: 38,000 square miles

Estimated Population: 211,000

Climate: Maritime and transition.
Average July temperature: Mid 30's to upper 60's.
Average January temperature: -10 to 40's.
Annual Precipitation: 20 inches.

Principle Resources: Fish and wildlife, timber, oil and gas, coal, scenery.

Major Sectors of the Economy: Government, military, service industries, oil and gas, fish, tourism, transportation.

The Cook Inlet problem area lies in the Southcentral subregion of Alaska. Extending from the crest of the Alaska Peninsula on the west and the Alaska Range on the north, the Cook Inlet area covers an area of 38,000 square miles. The land here is characterized by extensive glacier systems, considerable tectonic and volcanic activity, and extensive coastline with prolific sea life, and fairly extensive wilderness areas which support abundant wildlife.

Approximately 52 percent of the State's population reside in the Cook Inlet subregion. Since World War II the city of Anchorage has become the State's center of commerce and economic activity. Anchorage has become the headquarters for the oil and gas industry, and largely because of pipeline activity, has experienced rapid growth. Continued growth is expected at least for the balance of the 70's. Fishing and logging are also significant elements in the economy.

Conclusions

Problems identified include:

1. Water availability/quality.

   Need for expanding water supply and waste disposal facilities and for providing new facilities. Communities on the Kenai Peninsula are in particular need of more adequate water supplies.

   Urban encroachment on wetlands, farm lands, flood plains, and municipal watershed lands. Those areas in the Lower Susitna-Matanuska Valleys are particularly susceptible. Riverbanks and stream side quality have been seriously damaged on the Kenai River.

   Heavy pressures on and overcrowding of water-based recreational facilities and increased competition in recreational harvest of fish and wildlife resources is particularly true for waters accessible by road.

   Heavy water uses associated with urbanization and in some cases with agriculture are encroaching on instream needs. Relocating the capital to Willow will make this particularly true in the Matanuska-Susitna Valley.

2. Energy.

   Water resource concerns are with potential energy development associated with proposals for major new oil and gas, coal, and hydro developments. Oil and gas development in Lower Cook Inlet is located in or near important fishing grounds. Beluga coal may be developed for export and affect freshwater habitats for fish and water fowl. If the Susitna hydroelectric project becomes a reality, ecosystems will be altered.

3. Institutional.

   Significant changes in land use, ownership, and management will result from the Alaska Native Claim Settlement Act. Ownership of rivers, riverbanks, lake beds, and certain areas of the coastal zone will be increasingly disputed, along with allocation of water rights.

4. Ports.

   Existing Kenai Peninsula port and harbor facilities within Cook Inlet will require expansion to support projected growth.

5. Water use.

   Growth in agricultural activity or municipal or industrial water uses will undoubtedly affect water and water related planning. Problems are already occuring, especially on the Kenai Peninsula. Planning should focus on irrigation control, use of chemicals, and sedimentation.

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: NINILCHIK

Population: 134 Class: UNINCORPORATED

Region: COOK INLET REGIONAL CORPORATION

Number of Homes: 25

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: SOME INDIVIDUAL WELLS/ SOME HAULING FROM NINILCHIK RIVER

Adequacy of Present Supply: NINILCHIK RIVER CONTAMINATED DURING MOST OF THE YEAR/HIGH BACTERIA COUNTS NOTED/ Fe .05 ppm/HARDNESS 50 ppm/TDS 350 ppm/NO TREATMENT

Planned Improvements in Water Supply: PHS WATERING POINT PLANNED FOR 1979 WITH WELL AS SOURCE OF SUPPLY

History of Water Supply Projects: NO DATA AVAILABLE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL CANNERY CHURCH STORE	SEE ABOVE	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): HAUL TO CITY DUMP

B. Domestic Sewage Disposal Method(s): PRIVIES/CESSPOOLS

C. History of Waste Disposal Projects: NO DATA

D. Planned Improvements in Waste Disposal: NONE IN IMMEDIATE FUTURE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
CANNERY	DUMPS RAW INTO OCEAN
SCHOOL	
CHURCH	NO DATA
STORE	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING, STREAM OVERFLOW, COASTAL FLOODING, TELESEISMIC TSUNAMI.
Frequency: MINIMAL

Severity:

B. Erosion NONE

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: NO DATA

Fuels Available and Costs: NO DATA

D. Types of Commercial Transportation: ROAD

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance: _____%

F. Planned Housing and Other Capital Projects: NO DATA

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: TYONEK

Population: 250 Class: UNINCORPORATED

Region: COOK INLET REGIONAL CORPORATION

Number of Homes: 68

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: VILLAGE INSTALLED INFILTRATION GALLERY/LAKE IS THE SOURCE OF SUPPLY/CL

Adequacy of Present Supply: Fe 4.2 ppm, HARDNESS 4.0 ppm/TDS 60 ppm/ AMOUNT IS ADEQUATE/MUD AND SAND CLOGGING INFILTRATION GALLERY/PUMP HOUSE IN POOR SHAPE

Planned Improvements in Water Supply: PHS PLANS NEW WATER SOURCE DEVELOPMENT PROJECT IN 1979 IN CONJUNCTION WITH 27 NEW HUD HOUSES

History of Water Supply Projects: VILLAGE ABANDONED COMPLETE PHS WATER SYSTEM WHEN OIL ROYALTY MONEY WAS RECEIVED AND BUILT THEIR OWN SYSTEM

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SUPPLY	SEE ABOVE
STORE	COMMUNITY SUPPLY	
CLINIC	COMMUNITY SUPPLY	
LUMBER COMPANY		

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): GARBAGE IS COLLECTED WITH FLAT BED TRUCK AND DUMPED AT REFUSE PIT 2 MILES FROM VILLAGE/REFUSE COVERED SOMETIMES

B. Domestic Sewage Disposal Method(s): INDIVIDUAL SEPTIC TANKS AND TILE FIELDS/ 350-400 GALLON TANKS ARE UNDERSIZED SO EFFLUENT RUNS OVER GROUND SURFACE

C. History of Waste Disposal Projects: SEE ABOVE

D. Planned Improvements in Waste Disposal: HUD WILL FUND INDIVIDUAL SEPTIC TANKS FOR 27 NEW HOUSES

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEPTIC TANK
STORE	SEPTIC TANK
CLINIC	SEPTIC TANK
LUMBER COMPANY	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING, LOCAL DRAINAGE MAY BE APROBLEM/TELESEISMIC TSUNAMI/LOCAL TSUNAMI
Frequency: LESS THAN ONCE IN 100 YEARS

Severity: UNKNOWN

B. Erosion NO DATA

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: CHUGACH ELECTRIC PROVIDES POWER

Fuels Available and Costs: NO DATA

D. Types of Commercial Transportation: COMMERCIAL AIR/ICE ROAD ACROSS SUSITNA RIVER IN WINTER

E. Economic Factors: FEDERAL REVENUE SHARING

Sources of Village Revenue: NONE

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NO PLANS

KODIAK - SHELKOF
AREA

Area: 11,000 square miles

Estimated Population: 9,300

Climate: Maritime.
Average July temperature: Low 40's to low 60's.
Average January temperature: Low 20's to mid 40's.
Annual Precipitation: 20 to 60 inches.

Principle Resources: Fish and wildlife, including shellfish and sea mammals, timber, potential for minerals.

Major Sectors of the Economy: Fishing and seafood processing, government, tourism, trade and service industries.

Located in Southcentral Alaska, the Kodiak-Shelikof area covers 11,000 square miles of steep, rugged terrain, is extensively glaciated and includes the mountainous southern coast of the Alaska Peninsula and the Kodiak Island group. Volcanic activity and frequent earthquakes are characteristic of the area. The coastline of the Kodiak Island group is very irregular with many deep fiords and islands.

Historically, fishing and seafood processing have been the economic mainstay of this area and accounted for more than 30 percent of total employment in 1972. Major species include salmon, halibut, shrimp, and king, tanner and Dungeness crab. With a population of less than 4,000, the city of Kodiak is the commercial center for the problem area. Growth is anticipated for all major segments of the economy. There is also a potential for oil and gas development.

Conclusions

The State expects growth in the economy, population, and water uses of the Kodiak-Shelikof region. The Native village and Corporation's acquisition of land may stimulate developments. Expected petrochemical activities associated with the Lower Cook Inlet and Kodiak Outer Continental Shelf oil leasing will require increased support from the Kodiak community. Increased activities by both the fishing industry and the Coast Guard may result from implementation of the 2-mile fisheries limitations.

Problems identified in the area include:

1. Water use.

   Water use conflicts have developed between placer mining interests and fisheries, between wildlife and domestic red meat production, and between recreation users and commercial fishermen.

2. Ports.

   Adequate marine facilities are needed including scheduled service, boat moorage, port and harbor facilities.

3. Water availability.

   Adequate water supplies are needed for the communities of Kodiak, Karluk, Larsen Bay and Old Harbor. Water withdrawals are, in some instances, reducing quantity and quality of instream water for fish, waterfowl and wildlife habitat. Data is needed on water availability, especially data on groundwater aquifers.

4. Water quality.

   Adequate sanitary and garbage facilities at public use areas should be provided and maintained.

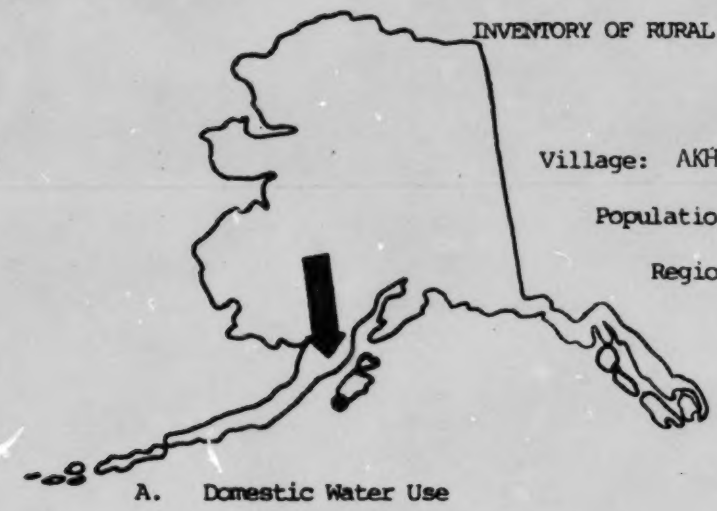
   There is a great potential for degradation of fresh and saltwater fisheries near and accessible to population centers and concentrated land uses. Secondary water treatment discharges to the sea may be harmful. Erosion and sediment production may be caused by livestock overuse of the range.

5. Instream use.

   Instream flow needs for fish and wildlife need to be provided for.

6. Flooding.

   Flood hazard areas--coastal flooding and erosion threats at Chignik, Karluk, Larsen Bay, Old Harbor, Ouizinkie, Perryville, Port Lions--need to be minimized



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: AKHIOK

Population: 114 Class: 2ND

Region: KONIAG, INC.

Number of Homes: 15

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS DAM ON CREEK/ PUMP/TRANSMISSION LINE/CL BUILDING/ GENERATOR/20,000 GALLON WOOD STORAGE TANK/PIPED SERVICE TO THE HOME/REQUIRES PUMPING BELOW 32°/GRAVITY FEED DISTRI- BUTION SYSTEM

Adequacy of Present Supply: WATER MAY BE TURBID DURING SPRING BREAKUP/CL DOES NOT WORK/GOOD QUALITY DRINKING WATER Fe .14 ppm/ HARDNESS 17 ppm/TDS 48 ppm

Planned Improvements in Water Supply: PHS HAS PLANS TO HOOK UP 15 HUD UNITS TO EXISTING SYSTEM IN 1979

History of Water Supply Projects: PART OF THE ABOVE SYSTEM STARTED SEPTEMBER 1964 AND COMPLETED IN JUNE OF 1965 BY PHS/5' HIGH DAM WAS ADDED IN 1967/ MANY SERVICE LINES HAVE FROZEN IN PAST WINTERS/PIPES NOT BURIED DEEP ENOUGH/ POOR MAINTENANCE/MAJOR WORK NEEDED TO BRING SYSTEM UP TO DESIGN STANDARDS

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
GRADE SCHOOL	WELL	GOOD DRINKING WATER

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): COLLECTION AND DUMPING AT DESIGNATED SITE ON HILLSIDE AND BEACH/ACCESSIBLE BY ROAD/LITTLE FILL MATERIAL AVAILABLE/KODIAK ISLAND BOROUGH RECEIVED EPA GRANT TO DEVELOP A LAND FILL SITE/O & M MAY POSE A PROBLEM FOR VILLAGE

B. Domestic Sewage Disposal Method(s): ALL HOMES HAVE FLUSH TOILETS/SEPTIC TANKS/LEACH FIELDS/BEACH PITS

C. History of Waste Disposal Projects: SOME SEEPAGE PITS HAVE BEEN OVERLOADED FOR THE PAST 5 OR 6 YEARS

D. Planned Improvements in Waste Disposal: PHS WILL COMPLETE DESIGN ON WASTE WATER DISPOSAL SYSTEM SUMMER 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEPTIC TANK/LEACH FIELD

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/LOCAL TSUNAMI/TELESEISMIS TSUNAMI

Frequency: MINOR

Severity:

B. Erosion MINOR PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: SCHOOL HAS OWN GENERATORS/PRIVATE GENERATORS

Fuels Available and Costs: OIL $.75 GALLON

D. Type of Commercial Transportation: KODIAK WESTERN AIRWAYS/BARGE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: OUZINKIE

Population: 173 Class: 2ND

Region: KONIAG, INC.

Number of Homes: 73

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: WATER INTAKE POINT NEAR STREAM/100,000 GAL WOOD STAVE STORAGE TANK/ BURIED PIPES/PIPED SERVICE TO THE HOMES/ CL/FL/2 HOMES HAUL FROM SPRING

Adequacy of Present Supply: STORAGE TANK LEAKS CAUSING ICE BUILD UP/Fe .30 ppm/HARDNESS 83 ppm/TDS 60 ppm IS THE CHEMICAL QUALITY

Planned Improvements in Water Supply: PHS EXTENSIONS FOR PROPOSED NEW HOUSING IN 1979 INCLUDING MOVING STORAGE TANK TO HIGHER GROUND

History of Water Supply Projects: PROJECT WAS BEGUN AFTER 1964 EARTHQUAKE AND TIDAL WAVES/OPERATION HAS BEEN GOOD BUT PHS HAS ASSISTED IN O & M WHEN CITY HAS PLEADED LACK OF FUNDS

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SUPPLY	SEE ABOVE
STORE	COMMUNITY SUPPLY	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): KODIAK ISLAND BOROUGH LAND FILL WEST OF TOWN/ NO COLLECTION OR COVERING YET.

B. Domestic Sewage Disposal Method(s): FOUR 2,000 GALLON AND 4-750 GALLON SEPTIC TANKS/OCEAN OUTFALL DRAIN FIELDS/SEPTIC TANK SYSTEM HAS FAILED REPEATEDLY BECAUSE OF POOR DRAINAGE/POOR O & M

C. History of Waste Disposal Projects: PHS SEPTIC TANKS/DRAIN FIELDS CONSTRUCTED IN 1966/SEWAGE SURFACED AND BACKUPS OCCURRED/ REPAIRS COMPLETED IN 1972

D. Planned Improvements in Waste Disposal: PHS EXTENSION FOR NEW HOUSING PROPOSED IN 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	VILLAGE SEPTIC TANK AND DRAIN FIELD
STORE	VILLAGE SEPTIC TANK AND DRAIN FIELD

F. Other Contamination: NONE SINCE THE SHELL FISH PROCESSOR BURNED

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/ TELESEISMIC TSUNAMI/LOCAL TSUNAMI

Frequency:

Severity:

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: VILLAGE OWNED 65 kw GENERATOR

Fuels Available and Costs: OIL $.47 GALLON

D. Type of Commercial Transportation: COMMERCIAL AIR SERVICE

E. Economic Factors:

Sources of Village Revenue: FEDERAL & STATE REVENUE SHARING/3% SALES TAX

Personal Income (per capita): $4,319

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: 23 HOUSING UNITS PROPOSED BY HUD IN 1979

Area: 11,000 square miles

Estimated Population: 7,100

Climate: Marine.
Average July temperature: Upper 30's to mid 50's.
Average January temperature: Low 20's to low 40's.
Annual Precipitation: 21 to 81 inches.

Principle Resources: Fish and wildlife, grazing land, minerals.

Major Sectors of the Economy: Government, sheep and cattle ranching, fishing, subsistence.

This area includes the Aleutian Islands, a small part of the Alaska Peninsula, and the Shumagin and Pribilof Islands. To the west of the Alaska Peninsula the Aleutian Mountain Range becomes gradually submerged, forming the 200 rocky islands of the 1100 mile Aleutian chain. This is a wild and primitive land, shaken by earthquakes and constantly swept by violent storms. Barren rocky areas and low growing plants cover the islands. The wildlife of the islands include substantial sea bird colonies, bald eagles, foxes, sea otters, and sea mammals.

This isolated, windswept area is sparsely settled. The Aleut villagers of the islands pursue a subsistence life style for the most part. Since World War II military installations and other Federal and State government spending has injected cash into the economy. Federal activity in the area is fairly extensive. The islands support some sheep and cattle ranching.

Economic growth in the Aleutians is expected from increases in fishing and agriculture and possible oil and gas development.

Conclusions

Major problems identified here include:

1. Water availability.

   Water for domestic use is often limited by small basins that are costly to develop. Few communities have a complete and adequate water system. Water-carried waste disposal is therefore often inadequate, creating many unsanitary and unhealthy conditions.

   Problems cited in regard to domestic water plague development of the fisheries processing plants. A study is underway examining potential of Aleutian geothermal spring waters for aquaculture.

2. Water quality.

   Development of oil in the area may risk pollution of very valuable fin, shellfish, sea mammal, and waterfowl resources found here in abundance. Sea life is a vital mainstay, and losses in key subsistence or commercial species would seriously endanger community well-being or even survival. Stabilization of an important harvest species like salmon could greatly enhance community well-being.

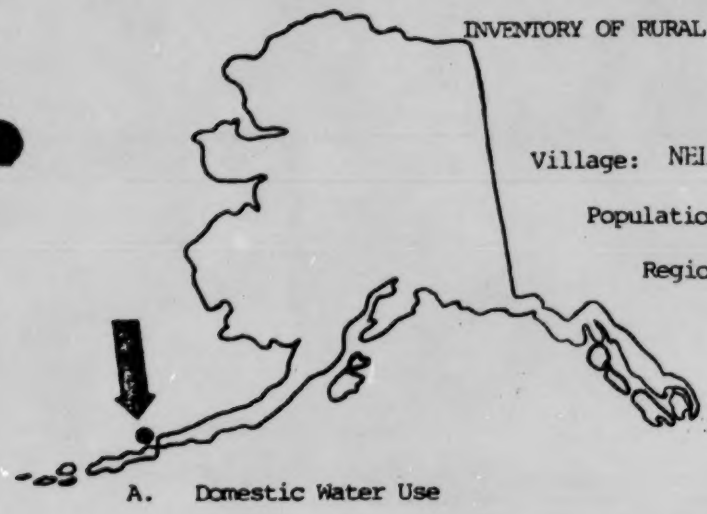
   Over grazing of sheep and cattle on some of the island has damaged streams through sedimentation.

3. Navigation.

   Inter-island water transportation (the most economically sound means available) is impaired by insufficient hydrographic data, inadequate port facilities, and poorly protected anchorages. This leads to increased freight costs (both in and out), and limited schedules and routes.

4. Energy.

   An economic way to generate small volumes of electric power from geothermal water resources could greatly improve the quality of life in some Aleut villages.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: NELSON LAGOON

Population: 55 Class: UNINCORPORATED

Region: ALEUT CORPORATION

Number of Homes: 16

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 9 INDIVIDUAL WELLS/ PHS WATERING POINT FOR DRINKING WATER/ CL/FL/640 GALLON STORAGE TANK

Adequacy of Present Supply: INDIVIDUAL WELLS ARE SALTY AND USED FOR TOILETS ONLY/WATERING POINT WATER IS A LITTLE BETTER/QUALITY OF INDIVIDUAL WELLS IS Fe .31 ppm/ DISSOLVED SOLIDS 550 ppm/HARDNESS 130 ppm

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: SALT WATER ENCROACHMENT OF INDIVIDUAL WELLS IS A CONTINUING AND SERIOUS PROBLEM

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	SAME AS VILLAGE	SEE ABOVE
CLINIC	SAME AS VILLAGE	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): REFUSE BURNED IN BARRELS AND DUMPED ON BEACH

B. Domestic Sewage Disposal Method(s): TOILETS FLUSH TO SEEPAGE PITS/HONEY BUCKETS DUMPED ON SPIT

C. History of Waste Disposal Projects: NO DATA

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL CLINIC	SEPTIC TANK/DRAIN FIELD

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/LOCAL TSUNAMI/TELESEISMIC TSUNAMI

Frequency:

Severity:

B. Erosion

Type of Erosion: WAVE ACTION

Severity: SOUTH FACE OF SPIT ERODING AT 2' PER YEAR

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: SUMMER EMPLOYMENT IN NEARBY CANNERIES

C. Power & Fuel:

Source(s) & Costs of Electricity: PRIVATE GENERATORS/2-60 kw GENERATORS AVAILABLE/EXPERIMANTAL WIND GENERATOR IN OPERATION

Fuels Available and Costs: NO DATA

D. Type of Commercial Transportation: AIR CHARTER

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NO DATA

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: UNALASKA

Population: 725 Class: 1ST

Region: ALEUT CORPORATION

Number of Homes: 62

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 2 SURFACE SOURCES/DAM/ RESERVOIR/BURIED PIPES/PIPED SERVICE TO THE HOMES/MILITARY INSTALLED SYSTEM CIRCA WW II/2 BACKUP WELLS

Adequacy of Present Supply: SOMETIMES CONTAMINATED/CL/FL/FILTRATION Fe .01 ppm/HARDNESS 3 ppm/TDS 25 ppm

Planned Improvements in Water Supply: PHS PROPOSES TO SERVE NEW HOUSES IN 1980

History of Water Supply Projects: COMMUNITY HAS SUCCESSFULLY OPERATED AND MAINTAINED THEIR OWN FACILITY SINCE 1940

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SUPPLY	SEE ABOVE
STORE	COMMUNITY SUPPLY	SEE ABOVE
CLINIC	COMMUNITY SUPPLY	SEE ABOVE
MOTEL	COMMUNITY SUPPLY	SEE ABOVE
PROCESSOR SHIPS	COMMUNITY SUPPLY	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): VILLAGE USES INDIVIDUAL PLASTIC CONTAINERS ON STEEL STANDS/COLLECTED TWO TIMES WEEKLY/DUMP SITE 2 MILES S.W. OF TOWN/SOIL CONDITIONS PROHIBIT ESTABLISHMENT OF LAND FILL SO GRAVEL PIT WILL BE USED

B. Domestic Sewage Disposal Method(s): SEPTIC TANKS/NO TREATMENT INTO BAY

C. History of Waste Disposal Projects: SEVERAL SEPTIC TANKS ARE FAILING/TOO MANY TOO CLOSE TOGETHER

D. Planned Improvements in Waste Disposal: DESIGN OF STP AND SYSTEM IN PROGRESS/FUNDED BY STATE GRANT

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
EAST POINT FISH PROCESSORS	DUMP INTO WATER AND CREATE NUISANCE WITH RATS ENFORCEMENT ACTION IS UNDERWAY

F. Other Contamination: MODERATE RODENT PROBLEM IN VILLAGE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/TELESEISMIC TSUNAMI/LOCAL TSUNAMI

Frequency: 40-60 YEARS

Severity: 20%

B. Erosion

Type of Erosion: BEACH

Severity: 2' PER YEAR IS LOST

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): UP

B. Seasonal Population Changes: FLUCTUATES DURING CRAB SEASON - SEPTEMBER THROUGH JUNE

C. Power & Fuel:

Source(s) & Costs of Electricity: CITY OWNED kwh & 1-100 kwh/PRIVATE GENERATORS ALSO
Fuels Available and Costs:

D. Types of Commercial Transportation: COMMERCIAL AIR SERVICE/BARGE

E. Economic Factors:

Sources of Village Revenue: FEDERAL & STATE REVENUE SHARING/1% SALES TAX

Personal Income (per capita): $4,517

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: HUD PROPOSES 12 HOUSES IN 1979

BRISTOL BAY AREA

Area: 40,000 square miles

Estimated Population: 5,950

Climate: Maritime and transitional.
Average July temperature: Upper 30's to upper 60's.
Average January temperature: 0 to upper 20's.
Annual Precipitation: 15 to 36 inches.

Principle Resources: Fish and wildlife including sea mammals, and minerals.

Major Sectors of the Economy: Commercial fishing and processing, government, recreation.

This area is bounded on the south by the Aleutian Range and encompasses the lands draining into Bristol Bay. Hills rise from a few hundred feet to over 2000 feet above the marshy, lake dotted coastal plain.

The Bristol Bay estuary with its tributary waters is the world's most productive red salmon fishery. The area also produces large quantities of bottom fish and shellfish. Bristol Bay provides habitat for almost the entire population of Pacific black brant, most of the world's emperor geese, hundreds of thousands of ducks, geese, swans, and millions of shorebirds.

In addition Bristol Bay receives income from tourism and trophy fishermen and hunters. Some of the larger trophy moose and bear are found in the area.

Recent explorations indicate potential for oil deposits in Bristol Bay, and the Bristol Bay Native Association has leased land for oil exploration. To protect the fishery, the Alaska Legislature identified areas of the eastern waters of the bay from which oil activity is excluded. Economic growth is anticipated for all major sectors of the economy.

Conclusions

The problems of Bristol Bay were found to be:

1. Water quality.

   Community water and sewer facilities are lacking for the majority of Bristol Bay residences. Fish processors are also short of water of adequate quality during some seasons.

   Oil exploration and development in or near Bristol Bay will place demands on the area's water resources, while imposing threats to fresh and saltwater habitats and to valuable wetlands. Development by the oil industry of water resources could assist communities in their efforts to improve water facilities.

   Bristol Bay lacks year-round transportation systems to support local and export commerce. Introduction of more roads, improved and increased sea transportation, and oil pipelines from or through the area will alter the uses and values of fresh and estuarine waters and present a continuing hazard to the habitats of many species of fish and wildlife.

   Large scale metals mining (iron at Kemuk Mountain near Dillingham, copper and related metals in the vicinity of Lakes Clark-Iliamna) are feasible in the future and carry potential for water degradation.

   This area hosts more than 95 percent of all sockeye salmon and includes the Alaska Trophy Trout Management Area. Water degradation poses a serious threat to these species.

2. Energy.

   Hydroelectric power-- Communities need better electrical alternatives than diesel power. Alternatives to diesel power have not been evaluated for this area.

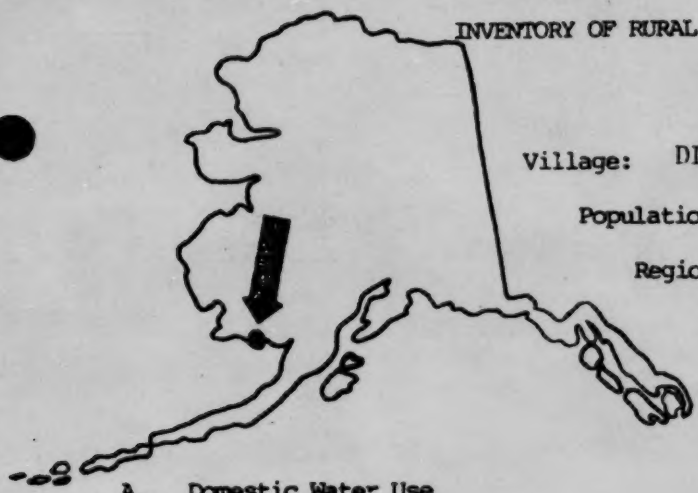
   Hydro power reserves have been identified for about 10 watersheds but several of these--examples, Lake Iliamna, Naknek Lake--are highly unlikely for any power development.

3. Water use.

   Access and easements to water margins and saltwater shores of Native Corporation owned lands may be a problem for many years, particularly with regard to public access.

4. Navigation.

   Improvements in harbor and navigational facilities are needed. A public dock is needed at Naknek. Dillingham's small boat harbor is inadequate. Aids to navigation, particularly between Dillingham and Togiak, need improvement.



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month / Year

Village: DILLINGHAM

Population: 1025 Class: 1ST

Region: BRISTOL BAY CORPORATION

Number of Homes: 200

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: CITY HAS 3 WELLS/100,000 GALLON WOOD STAVE STORAGE TANK/PIPED SERVICE TO HOMES/WINDMILL HILL AREA HOMES USE SHALLOW WELLS/WOOD RIVER - PETLAVILLE AREA USES INDIVIDUAL WELLS/ NEW WELL DRILLED BY PHS FOR DILLINGHAM TOWNSITE

Adequacy of Present Supply: CITY'S OLD WELL IS HIGH IN IRON 4-11.5 ppm AND DOES NOT YIELD ENOUGH WATER TO MEET CITY NEEDS/ SOME INDIVIDUAL WELLS SUBJECT TO SEPTIC TANK CONTAMINATION

Planned Improvements in Water Supply: 1979 PHS WILL BUILD 200,000 GAL STORAGE TANK FOR DILLINGHAM TOWNSITE/DRILL NEW WELLS WHICH WILL SERVE AS WATERING POINTS FOR PETLAVILLE/WOOD RIVER AND WINDMILL HILL/NEW HOUSES WILL BE HOOKED UP TO TOWNSITE SYSTEM IN 1979

History of Water Supply Projects: ORIGINAL WATER DISTRIBUTION SYSTEM BUILT BY CITY IN 1966 TO SERVE 150 USERS

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
KANKANAK HOSPITAL	2 WELLS/IRON REMOVAL	QUALITY IS GOOD/Fe .05 ppm/HARDNESS 56 ppm/ TDS 114 ppm

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): OPEN DUMP NEAR AIRPORT/TRUCK USED FOR COLLECTION/ OPEN BURNING/VISUAL PROBLEM/UNFENCED SITE/DOZER AVAILABLE FOR COVERING/SITE MAY BE MOVED

B. Domestic Sewage Disposal Method(s): 50,000 GALLON EXTENDED AERATION TREATMENT PLANT/NOT USED BECAUSE OF HIGH O & M COST/SEWAGE BYPASSES PLANT AND DISCHARGES TO SEA VIA NUSHAGAK RIVER/MANY USE SEPTIC TANKS AND DRAIN FIELDS/POOR SOIL AND HIGH GROUND WATER LEAD TO INADEQUATELY TREATED SEWAGE

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: PHS WILL BUILD NEW LAND FILL AND 1 ACRE LAGOON IN 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
CANNERY	SEPTIC TANKS/DRAIN FIELD
SCHOOL	SEPTIC TANKS/DRAIN FIELD
CLINIC	HONEY BUCKETS

F. Other Contamination:

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING

Frequency: EVERY YEAR

Severity: SERIOUS/VILLAGE MUST RELOCATE/NEW HOUSING ON HILL--NO FLOODING

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: INDIVIDUAL GENERATORS/SCHOOL HAS 20 kw GENERATOR

Fuels Available and Costs: NO DATA

D. Types of Commercial Transportation: AIR SERVICE/BARGE SERVICE

E. Economic Factors:

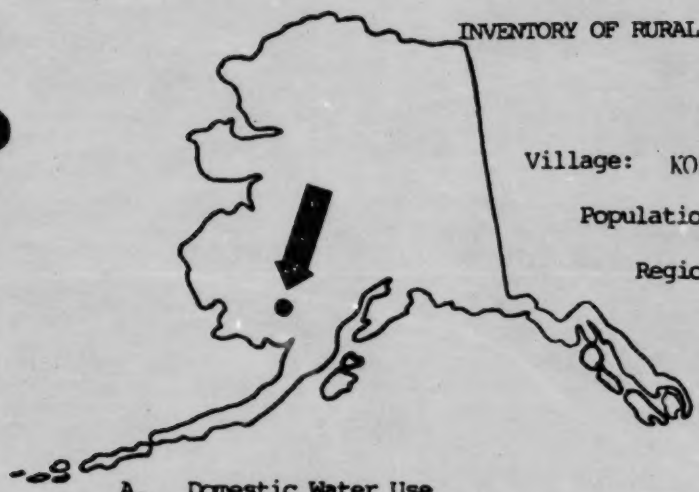
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $2,372

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: KOLIGANEK

Population: 142 Class: UNINCORPORATED

Region: BRISTOL BAY CORPORATION

Number of Homes: 20

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 100' WELL/ BURIED PIPES/PIPED SERVICE TO THE HOMES/CL/FL AVAILABLE BUT RARELY HOOKED UP BY VILLAGE

Adequacy of Present Supply: GOOD TASTING DRINKING WATER/CHEMICAL QUALITY IS Fe .32 ppm/HARDNESS 42 ppm/TDS 72 ppm

Planned Improvements in Water Supply: NONE IN IMMEDIATE FUTURE

History of Water Supply Projects: DURING WINTER 1970-73, SYSTEM FROZE DUE TO POORLY INSULATED DISTRIBUTION SYSTEM/LINES INSULATED BY PHS AND ARE OK NOW/DEPENDABLE WELL WAS DEVELOPED AND WATER SYSTEM REPLACED WITH ARCTIC CONDUIT/FROZE UP WINTER OF 1978 DUE TO LACK OF HEATING OIL/OPERATING AS OF JAN 1979

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL STORE	COMMUNITY SUPPLY	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): OPEN DUMP

B. Domestic Sewage Disposal Method(s): PHS SYSTEM/SEPTIC TANKS/DRAIN FIELDS DISCHARGE INTO STREAM/HONEY BUCKETS ARE ALSO USED

C. History of Waste Disposal Projects: PHS HAS RENOVATED SYSTEM BY INSTALLING 2 NEW SEPTIC TANKS AND DRAIN FIELDS/O & M HAS BEEN A PROBLEM IN THE VILLAGE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	COMMUNITY SYSTEM

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: STREAM OVERFLOW

Frequency: 40-60 YEARS

Severity: 10%

B. Erosion NONE

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: 2 PRIVATE GENERATORS PROVIDE POWER TO 8 HOMES/SCHOOL HAS 2-25 kw GENERATORS AND SUPPLIES POWER TO VILLAGE FOR 9 MONTHS

Fuels Available and Costs: AIR SERVICE/BARGE

D. Type of Commercial Transportation: AIR/BARGE SERVICE

E. Economic Factors:

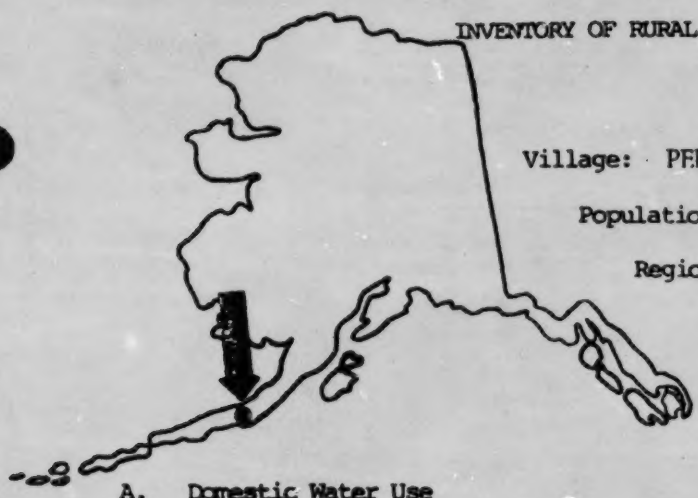
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: PERRYVILLE

Population: 101 Class: UNINCORPORATED

Region: BRISTOL BAY CORPORATION

Number of Homes: 25

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: INDIVIDUAL SHALLOW WELLS/DAMMED STREAM WITH PIPED SERVICE TO HOMES VIA BURIED 2-INCH PIPE INSTALLED BY VILLAGERS IN 1974

Adequacy of Present Supply: WELLS MAY BECOME BRACKISH TASTING DURING HIGH TIDES ASSOCIATED WITH FALL STORMS

Planned Improvements in Water Supply: PHS WILL COMPLETE WATER DISTRIBUTION SYSTEM TO SERVE 25 HOMES AND REVAMP DAM IN 1979/SOURCE OF SUPPLY WILL BE SMALL STREAM WITH YIELD OF 300 GPM

History of Water Supply Projects: PHS DRILLED DEEPER WELLS IN 1959 TO LOCATE FRESH WATER AQUIFER - THIS WAS NOT SUCCESSFUL/1960 PROPOSAL FOR WATER POINT DRAWN UP BY SANATARIAN/DUE TO LIMITED FUNDS, CONSTRUCTION DELAYED SEVERAL TIMES/1974 PLASTIC HOSE LAID BY VILLAGERS FROM CREEK TO TOWN BUT FROZE UP IN WINTER

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
STORE	COMMUNITY SUPPLY	SEE ABOVE
SCHOOL	OWN WELL - 25'/300 GAL. TANK	GOOD DRINKING WATER
CHURCH		

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): DUMP ON BEACH

B. Domestic Sewage Disposal Method(s): PIT PRIVIES/FLUSH TOILETS TO STEEL DRUM SEEPAGE PITS/HONEY BUCKETS

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: INDIVIDUAL WOOD SEPTIC TANKS AND DRAIN FIELDS WILL BE CONSTRUCTED/LAND FILL WILL BE BUILT AND FENCED AND BACKHOE TRANSFERRED TO VILLAGE IN 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
STORE	CESS POOL
SCHOOL	750 GAL. SEPTIC TANK/150' DRAIN FIELD
CHURCH	
CHAPEL	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW/TELESEISMIC TSUNAMI/LOCAL TSUNAMI

Frequency: 60-100 YEARS

Severity: 100%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: INDIVIDUAL GENERATORS FOR 10 HOMES

Fuels Available and Costs: OIL $.70/GASOLINE $1.10 GALLON

D. Type of Commercial Transportation: AIR TAXI/BARGE TRAFFIC - LIGHTERAGE TO VILLAGE/ NO BOAT HARBOR HERE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

KUSKOKWIM BAY
AREA

Area: 58,000 square miles

Estimated Population: 12,500

Climate: Transitional and continental.
Average July temperature: High 30's to high 60's.
Average January temperature: -12 to mid 20's.
Annual Precipitation: 13 to 37 inches.

Principle Resources: Timber, fish, wildlife, waterfowl nesting areas, potential for minerals.

Major Sectors of the Economy: Subsistence, small scale mining, limited forest industry, government spending.

Located in southwestern Alaska, two dissimilar areas are tied together by Kuskokwim River-- the mountain-enclosed upper river basin and the coastal delta. From the uplands of central Alaska, the Kuskokwim flows through a wide forested valley dotted with lakes, sloughs, and oxbows. The river's myriad tributaries drain the western portions of the Alaska Range and the Kuskokwim and Taylor Mountains. Other mountains occasionally intrude into the delta, whose most notable features are the numerous lakes ranging in size from less than an acre to thousands of acres. The area supports a variety of wildlife, and musk ox have been reestablished on Nunivak Island. The combined Yukon-Kuskokwim delta area is an important waterfowl nesting area. It produces a fall flight of about 2.3 million ducks and unequaled numbers of geese.

The largest population center in the area is Bethel (population 2,416). Villages of the area are scattered along the Kuskokwim and Yukon Rivers, and near the coast. The economy of the area is primarily subsistence, augmented by government spending, some small scale mining, and a limited forest industry. Economic growth is expected to come from exploration for and development of oil and gas, beginning cultivation and increased reindeer ranching, increased commercial fishing, and recreation.

Conclusions

This area's problems are as follows:

1. Water quality.

   Numerous villages have groundwater of poor quality in the Kuskokwim Bay area. Coastal villages (Chefornak, Eek, Kipnuk, Kongiganak, Mekoryuk, Newtok, Quinhagak) are troubled by saltwater intrusion into their groundwater systems. Others are bothered by groundwater containing high concentrations of nitrate (Mekoryuk). This lack of water of good quality impairs the economic growth of the area. The absence of suitable water for domestic use and for fish processing prevents the full development of the fisheries resource and hinders the economic development and life style of the communities in the area.

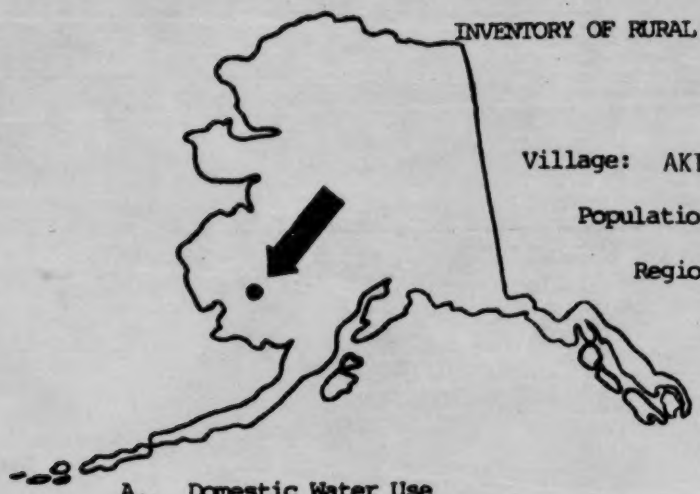
   Surface water, wetland, estuarine, and possibly groundwater quality may be degraded due to the development of the potential mineral and petroleum resources in the area. Increased sedimentation and the potential pollution from accidental spills from road building and exploratory drilling could affect domestic as well as fish and wildlife water supplies and habitats.

2. Flooding.

   Spring flooding is a problem along the Kuskokwim River (McGrath, Bethel, Crooked Creek, Sleetmute, Aniak, Akiak, Akulurak). The lack of identification of flood-prone lands hinders the proper management of the flooding. Indiscriminant development on those lands results in property damage or losses which place a burden on the owners, and in the case of government housing on the taxpayers.

3. Institutional.

   There is a continual lack of funds for the operation and maintenance of several village water supply and sewage treatment facilities due to the lack of a sufficient economic base. When these facilities close down, inadequate treatment poses a health hazard to the users. Untreated sewage can pollute the related land and surface and groundwater resources in and around the communities.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: AKIACHAK

Population: 371 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 63

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 179' WELL/SUBMERSIBLE PUMP/1,000 GAL WOOD STORAGE TANK/OIL HEATER/CL/RESIDENTS PACK WATER FROM RIVER FOR DRINKING AS SYSTEM IS FROZEN/ BIA WELL USED AS COMMUNITY WATERING POINT AS OF DEC 1978

Adequacy of Present Supply: 1,000 GAL STORAGE CAPACITY IS INADEQUATE/RIVER WATER IS NOT TREATED

Planned Improvements in Water Supply: PHS WILL PROVIDE TECHNICAL ASSISTANCE TO VILLAGE IN 1979

History of Water Supply Projects: SYSTEM BUILT 1961/FROZE 1971/POORLY MAINTAINED FOR 6 YEARS/WELL HOUSE DAMAGED BY VANDALS

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
BIA SCHOOL	OWN WELL	PACKAGE PLANT REDUCES IRON TO 0.1/FILTRATION AND SEDIMENTATION

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): 2 OPEN DUMPS OUTSIDE VILLAGE

B. Domestic Sewage Disposal Method(s): PRIVIES/BUT FEW OF THE 37 BUILT BY PHS ARE STILL STANDING/SO HONEY BUCKETS ARE USED WITH INDISCRIMINATE DUMPING

C. History of Waste Disposal Projects: PRIVIES AND SEEPAGE PITS POORLY MAINTAINED

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
BIA SCHOOL	1,500 GAL SEPTIC TANK AND 90'x150' SUBSURFACE LEACH FIELD ON RIVER BANK FAILED/CONTAMINATION SLOUGH BY LEACH FIELD

F. Other Contamination:

III. FLOODING & EROSION

A. Flooding NO DATA

Type of Flooding:

Frequency:

Severity:

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: CITY OWNED 330 kw GENERATOR/$.24 kwh WITH $15.00 MONTHLY MINIMUM

Fuels Available and Costs: OIL $.65/GALLON/GAS $.95/GALLON/NO BULK STORAGE

D. Type of Commercial Transportation: BARGE/AIR SERVICE

E. Economic Factors:

Sources of Village Revenue: NATIVE FUND

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: ATMAUTLUAK (AKOLMIUT)

Population: 140 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 29

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: HAUL FROM RIVER/ SHALLOW LAKES/ICE IN WINTER

Adequacy of Present Supply: UNDEVELOPED/UNTREATED SOURCE OF SUPPLY/ CHRONIC DIARRHEA PROBLEMS NOTED

Planned Improvements in Water Supply: PHS COMMUNITY WATERING POINT PLANNED FOR 1979 INCLUDING TREATMENT FOR IRON REMOVAL

History of Water Supply Projects: NONE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	WELL	UNKNOWN
CLINIC	HAUL FROM RIVER	UNTREATED SOURCE
STORE	HAUL FROM RIVER	UNTREATED SOURCE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING IN VILLAGE/OPEN BURNING NOTED

B. Domestic Sewage Disposal Method(s): PRIVIES/HONEY BUCKETS DUMPED IN SHALLOW PITS IN VILLAGE/INDISCRIMINATE DUMPING

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: PHS FACILITY PLANNED FOR 1979 BUT SCOPE OF PROJECT NOT YET DEFINED

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	1 CELL LAGOON
CLINIC	PRIVIES AND/OR HONEY BUCKETS
STORE	PRIVIES AND/OR HONEY BUCKETS

F. Other Contamination: OIL SLICK ON WATER AROUND VILLAGE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: STREAM OVERFLOW

Frequency: 5-20 YEARS

Severity: UNKNOWN

B. Erosion MINOR PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: VILLAGE OWNED 33 kw GENERATOR/INDIVIDUAL GENERATORS/BULK OIL & GAS STORAGE
Fuels Available and Costs: OIL $.62/GASOLINE $.75

D. Types of Commercial Transportation: AIR & BARGE SERVICE

E. Economic Factors:

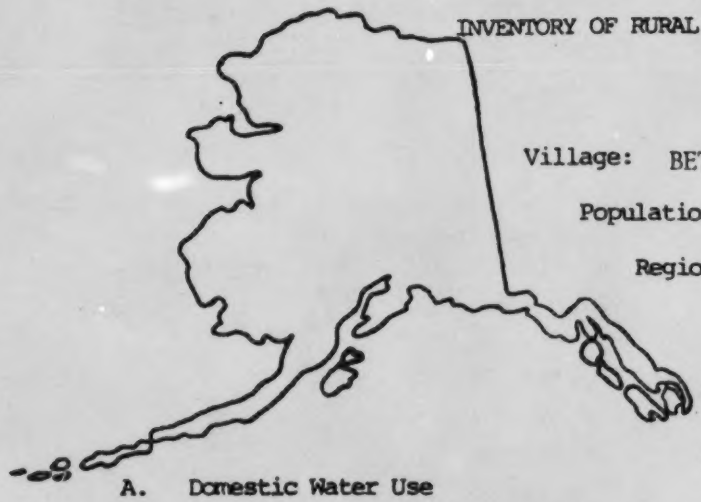
Sources of Village Revenue: 1% SALES TAX/STATE & FEDERAL REVENUE SHARING

Personal Income (per capita): $2,050

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: BETHEL

Population: 3,700 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 600

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 400' WELL/CL/FL/ FILTRATION FOR IRON/BURIED PIPES TO HOMES ON HILL/UTILIDOOR TO NEW HOMES ON HILL/OLDER SECTIONS HAUL FROM WELL/CITY DELIVERS TO ALL HOMES CONTRACTING FOR WATER SERVICE/RAIN WATER AND ICE ALSO USED

Adequacy of Present Supply: CHEMICAL QUALITY OF COMMUNITY WELL IS Fe .4 ppm/CL 6 ppm/ HARDNESS 127 ppm/TDS 200 ppm

Planned Improvements in Water Supply: STATE GRANT WILL BE USED TO DEVELOP NEW WELL TO SERVE COLLEGE AND CITY JAIL, LIBRARY ETC IN 1979 WITH PIPED SERVICE/ ADDITIONAL $2,000,000 STATE GRANT AVAILABLE IN 1979 FOR IMPROVEMENTS

History of Water Supply Projects: FIRST TRUCK DELIVERY SYSTEM BUILT IN 1960/ FIRST PHS SYSTEM BUILT IN 1968/CATOSTROPHIC POWER FAILURE 1975/PIPES FROZE/ CORPS REBUILT DISTRIBUTION SYSTEM FOR $6,000,000/CHRONIC BREAKDOWN OF WATER DELIVERY TRUCK ALSO NOTED/INCREASED WATER USAGE, UNRELIABLE POWER SOURCE AND POOR OPERATOR SURVEILLANCE HAS COMPLICATED THE PROBLEMS

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL MOST COMMERCIAL BUSINESSES HAVE THEIR OWN WELLS	USE PHS SYSTEM	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): OPEN DUMP/COLLECTION SYSTEM/SOME OPEN BURNING/ WIND BLOWN MATERIAL/OCCASIONAL FLOODING PROBLEM/ODOR PROBLEM IN SUMMER

B. Domestic Sewage Disposal Method(s): COLLECTION SYSTEM SERVING NEW HOUSES BUILT WITH FEDERAL DISASTER FUNDS/OTHERS DUMP HONEY BUCKETS INTO LAGOON OR ALONG RIVER BANK/HONEY BUCKET COLLECT SYSTEM BY CITY

C. History of Waste Disposal Projects: PUBLIC DUMP AND WASTE WATER LAGOON UNDER POOR MANAGEMENT SINCE 1966/CAUSE OF SEWER LINE FREEZE UPS IS FLUSHING OF FOREIGN OBJECTS DOWN TOILETS AND SUBSEQUENT PLUGGING OF LINES

D. Planned Improvements in Waste Disposal: STATE GRANT WILL BE USED TO SERVE KCC, JAIL ETC WITH PIPED SEWER IN 1979/DISCHARGE TO PHS LAGOON

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
MIDDLE SCHOOL	OWN TREATMENT PLAN DISCHARGE TO TUNDRA
HOSPITAL	PUMPS WASTE TO LAGOON
HOTEL,SWANSONS, N/C	SECONDARY TREATMENT-LAKE OUTFALL
HIGH SCHOOL	HOOKED TO PHS SYSTEM

F. Other Contamination: DEAD ANIMAL CARCASSES/WASTE OIL SPILLS

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM

Frequency: 1-5 YEARS

Severity: 30-40%

B. Erosion

Type of Erosion: RIVER BANK

Severity: BAD PROBLEM/HOSPITAL RELOCATING/BOAT LAUNCHING SITE GOING IN 1977

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP - RAPID INCREASE

B. Seasonal Population Changes: INFLUX OF CONSTRUCTION/CANNERY WORKERS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: BETHEL UTILITIES 8,400 kw GENERATOR 7.4¢ kwh, COMMERCIAL/$11.2 kwh DOMESTIC/9.6¢ PER GALLON

Fuels Available and Costs: OIL $.70 PER GALLON/GASOLINE $.90 PER GALLON

D. Type of Commercial Transportation: JET SERVICE/BARGE

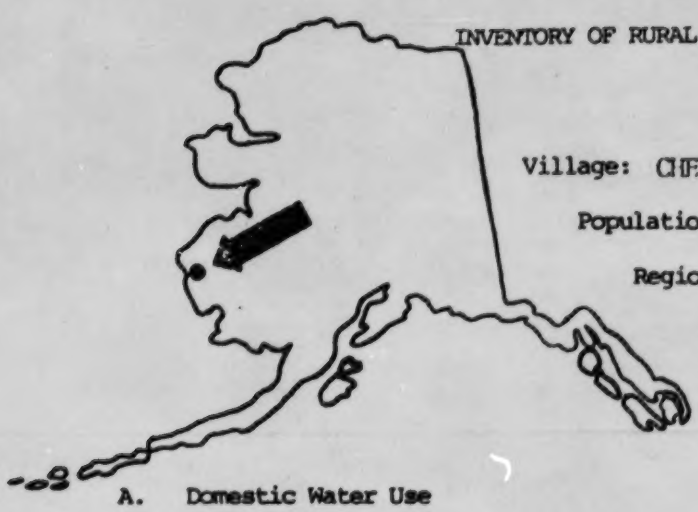
E. Economic Factors:

Sources of Village Revenue: 3% SALES TAX/REVENUE SHARING/BLOCK GRANTS/ LAND SALES & LEASES
Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: CHEVAK

Population: 550 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 62

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS WELL/2 VILLAGE SAFE WATER WATERING POINTS/IRON REMOVAL/CL/BATHING AND LAUNDRY FACILITIES/SOME USE ICE AND RAIN FOR DRINKING AND VSW FOR BATHING ONLY

Adequacy of Present Supply: SOME IRON TASTE NOTED AFTER TREATMENT AND UNACCEPTABLE TO SOME VILLAGERS/Fe 1.5-3.00 ppm/ HARDNESS 189 ppm/TDS 200 ppm

Planned Improvements in Water Supply: NONE IN IMMEDIATE FUTURE

History of Water Supply Projects: SPRING 1974 VSW FACILITY COMPLETED/1974 THROUGH SPRING OF 1977 BUILDING HAS FROZE UP SEVERAL TIMES DUE TO LACK OF FUEL OIL STORAGE CAPACITY/1974-75 VSW WELL INFILTRATED WITH SAND/ PROBLEM CORRECTED LATE 1975/2ND VSW WATERING POINT ADDED 1978

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	OWN WELL/1,500 STORAGE TANK	Fe .98 ppm/CL 12 ppm/
SCHOOL	OWN WELL	HARDNESS 144 ppm/
STORE	OWN WELL	TDS 222 ppm/CL/SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): CENTRAL DISPOSAL PIT PLUS TRASH BURNING/ PROMISCOUS DUMPING ON FLATS BELOW VILLAGE

B. Domestic Sewage Disposal Method(s): VSW FACILITY, HONEY BUCKETS AND SCHOOL WASTE GIVEN PRELIMINARY AERATION AND SOLIDS SEPARATION THEN DISCHARGED INTO LAGOON/FOAM PROBLEMS

C. History of Waste Disposal Projects: LAGOON DIKE HAS BEEN DETERIORATING AND IS IN NEED OF REPAIR/LAGOON FENCES & CONTROLLED OVERFLOW INSTALLED IN 1978 AS WAS PRELIMINARY WASTE WATER TREATMENT

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOLS	SETTLING/AERATION/½ ACRE LAGOON 108'x208'x5'WITH OVERFLOW
STORE	HONEY BUCKET
CLINIC	VSW

F. Other Contamination: BULK OIL NEAR BULK STORAGE TANKS

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW IN LOWLANDS/NEW VILLAGE ABOVE 100 YEAR FLOOD MARK

Frequency: LESS THAN ONCE IN 100 YEARS

Severity: 10%

B. Erosion

Type of Erosion: RIVER

Severity: SOME BUILDINGS MUS BE MOVED

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 300 kw $.37 kwh with $18.20 MONTHLY MINIMUM

Fuels Available and Costs: OIL $1.15/$1.20 GALLON/BLAZO $1.60/KEROSENE $1.25 GALLON

D. Type of Commercial Transportation: SUMMER BARGE/AIR CHARTER FROM BETHEL & HOOPER BAY

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING/2% SALES TAX/VSW USER FEES

Personal Income (per capita): $1,533

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

Area: 45,000 square miles Estimated Population: 62,400

Climate: Continental.
Average July temperature: Mid 40's to upper 70's.
Average January temperature: -10 to upper 20's.
Annual Precipitation: Moderate to low.

Principle Resources: Fish and wildlife, timber, coal, minerals.

Major Sectors of the Economy: Government, military, University of Alaska.

The Tanana area is bounded on the south by the northern flanks of the Alaska Range and includes the lands drained by the Tanana River. This area also includes Mount McKinley National Park. The interior is primarily a broad plateau of rolling hills, periodically intersected by mountains. Forests of birch and spruce cover much of the lands along river valleys, and the land supports abundant wildlife. Discontinuous permafrost is present throughout the area.

The city of Fairbanks is the largest city in the area, and there are numerous small villages scattered throughout. Many of the people, both Native and non-Native, are dependent on a subsistence economy.

Government is a major component of the economy. The main campus of the University of Alaska was established at College near Fairbanks and has made significant contributions to the economy.

Fairbanks and the surrounding areas experienced rapid growth during construction of the Trans-Alaska Pipeline. Continued growth is expected for the balance of the century with expansion of industry, forestry and agriculture.

Conclusions

The problems of this area were found to be:

1. Water quality and quantity.

   Water supplies for commmunities, industries, or agriculture need enlargement, improvement in quality, and, in some cases, protection from contamination or restrictions for instream flows.

   With recent growth, Fairbanks needs enlargement of water supply, treatment and distribution systems. Some groundwaters in the vicinity of Fairbanks are contaminated with arsenic (a serious health hazard), iron, or sewage effluent. The Healy reservoir and Tok groundwater supplies are subject to contamination by flooding. Withdrawal of irrigation waters at Big Delta (and potentially other sites) may impair instream flows.

   Sewage and solid waste disposal systems in the area need particular attention. Sewage contamination from individual homes is a potential or existing problem in Nenana, Fairbanks, Healy, and Tok. Solid waste disposal methods are inadequate area-wide, and commonly contaminate surface and groundwaters.

   Potential for serious water pollution problems exists with regard to agricultural and oil industry chemicals or contaminants.

   Erosion and sedimentation of silt soils, degrading quality of waters and stream habitat, can easily result from poor road building, logging, and agriculture practices. Cropped soil wind erosion also occurs near the Delta River.

   Haphazard urban development in and near communities leads to degraded water quality, costly water and sewer utilities, flood hazards, lowering of the water table (Tok), and other water related problems.

2. Flooding.

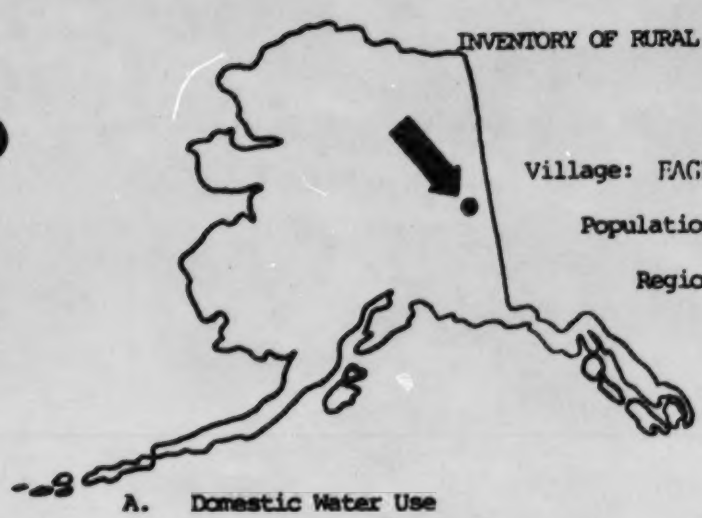
   This area of Alaska has historically been flood-prone. Topography and climate combine to abet flood danger from the spring break-up period through early fall. The disastrous 1967 Fairbanks flood is but one example of this danger.

3. Instream use.

   Protection for instream flows for fish and wildlife habitat is needed for streams of the area. This is true in the vicinity of Big Delta, and is also reported true for the Chatanika River.

4. Ice fog.

   Ice fog develops from power, heating, and transportation systems in the Fairbanks-North Pole communities.



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month / Year

Village: EAGLE VILLAGE

Population: 36 Class: 2ND

Region: DOYON LTD.

Number of Homes: 15

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: HAUL FROM COMMUNITY SPRING/IN WINTER EAGLE CITY COMMUNITY WELL ALSO USED/HAUL DISTANCE 3 MILES/NEW 120' WELL

Adequacy of Present Supply: VILLAGE WATER IS NASTY TASTING AND LOOKING/LEAVES A WHITE CRUST IN TEA KETTLES/NO TREATMENT

Planned Improvements in Water Supply: PHS IMPROVEMENTS SLATED FOR 1979 OR 1980

History of Water Supply Projects: NONE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
MISSION SCHOOL	WELL	POOR TASTE/HIGH IN Fe
CLINIC	WELL	" "

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING/BURNING IN 55 GALLON BBLS/ GARBAGE OFTEN THROWN OVER RIVERBANK

B. Domestic Sewage Disposal Method(s): PRIVIES/CESS POOLS

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
MISSION SCHOOL	SEPTIC TANK DISCHARGE TO YUKON

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding NO DATA

Type of Flooding:

Frequency:

Severity:

B. Erosion NONE

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FIRE FIGHTING IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: VILLAGE CORP 10 kw GENERATOR

Fuels Available and Costs: GASOLINE $1.10 GALLON

D. Type of Commercial Transportation: HIGHWAY/COMMERCIAL AIR SERVICE

E. Economic Factors:

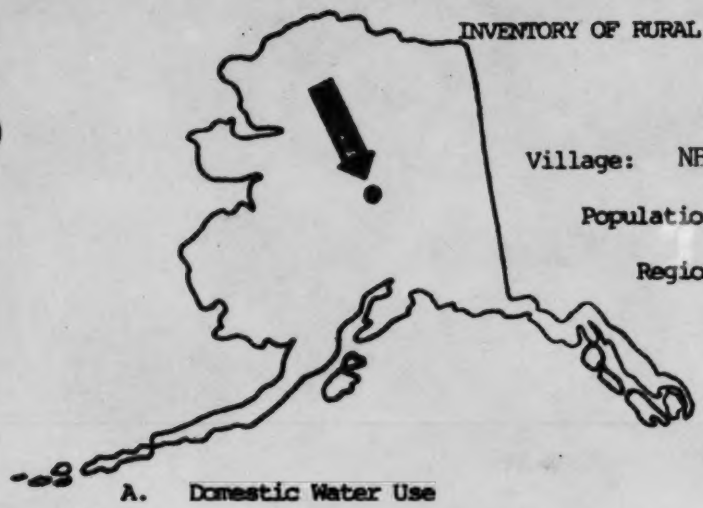
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): NO DATA

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: NENANA

Population: 486 Class: 1ST

Region: DOYON LTD.

Number of Homes: 128

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 90% HAVE INDIVIDUAL SHALLOW WELLS/OTHERS HAUL FROM NEIGHBORS/AVERAGE DEPTH 20' A FEW DRILLED TO 70'

Adequacy of Present Supply: QUALITY PROBLEMS - 2.3 ppm TO 4.5 Fe/TDS 282 ppm/HARDNESS 245 ppm AND 1.68 ppm MANGANESE

Planned Improvements in Water Supply: A COMPLETE PHS WATER DISTRIBUTION SYSTEM IS BEING PLANNED TO SERVE NEW BIA - HUD HOUSING/FUNDING PROBLEMS HAS SLOWED PROGRESS/CONSTRUCTION IN 1979

History of Water Supply Projects: NONE AS PHS SYSTEM IS NOT IN OPERATION

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
BANK	INDIVIDUAL WELLS	HIGH IN IRON
SCHOOL	FOR ALL	SEE ABOVE
STORES		
CHURCHES		

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s):

B. Domestic Sewage Disposal Method(s): SOME PRIVIES/SOME HONEY BUCKETS/MAIN PART OF VILLAGE UTILIZES OLD RAILROAD SEWAGE SYSTEM/GRAVITY SYSTEM DISCHARGING TO TANANA RIVER

C. History of Waste Disposal Projects: SOME PARTS OF LINE FREEZE EVERY WINTER

D. Planned Improvements in Waste Disposal: BIO DISC TREATMENT PLANT PLANNED BY PHS IN 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
UNKNOWN	

F. Other Contamination:

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW DUE TO MELTING SNOW

Frequency: 5-20 YEARS (ALMOST YEARLY FLOODING)

Severity: 90%

B. Erosion

Type of Erosion: RIVER BANK

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP

B. Seasonal Population Changes: MINOR IN MIGRATION IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: GOLDEN VALLEY ELECTRIC/$.10/kw - 1ST 50 kw/$5.27 NEXT 1400 kw

Fuels Available and Costs: FUEL OIL $.63/GASOLINE $.88 GALLON

D. Type of Commercial Transportation: HIGHWAY/RAILROAD/BARGE SERVICE

E. Economic Factors:

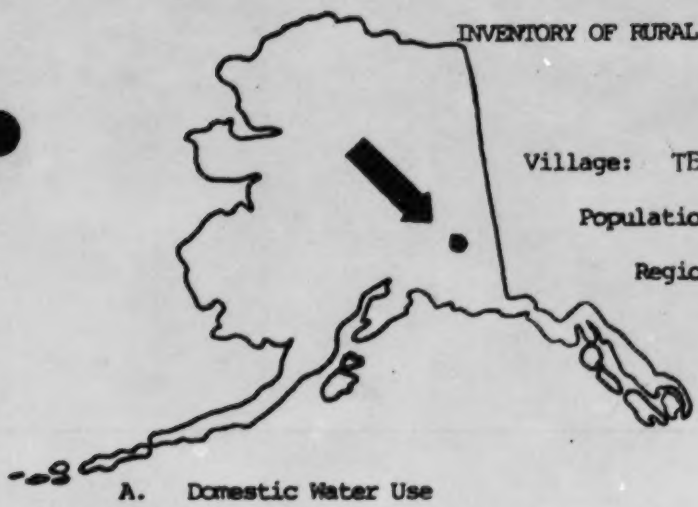
Sources of Village Revenue: FEDERAL AND STATE REVENUE SHARING/2% SALES TAX

Personal Income (per capita): $4,006

Sources: private employment 50 % public employment 25 %

public assistance 25 %

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: TETLIN

Population: 85 Class: UNINCORPORATED

Region: DOYON LTD.

Number of Homes: 32

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS CENTRAL FACILITY/ 56' WELL/WATERING POINT/CL/LAUNDRY/ BATHING/HYDRO PNEUMATIC SYSTEM

Adequacy of Present Supply: FACILITY FROZE UP/PRESENTLY USING WATERING POINT ONLY/CL NOT IN USE/ CHEMICAL QUALITY IS Fe .1 ppm/ TDS 184 ppm/HARDNESS 214 ppm

Planned Improvements in Water Supply: PHS PROVIDED TECHNICAL ASSISTANCE IN 1978/ VILLAGE MUST PURCHASE HOT WATER GENERATOR BEFORE SYSTEM CAN BE RETURNED TO FULL OPERATION

History of Water Supply Projects: 1967 - PHS WATERING POINT WITH LAUNDROMAT BUILT AT A COST OF $31,000 AND DESTROYED BY VANDALISM/REPAIRS MADE BUT SYSTEM VANDALIZED AGAIN/PLANS MADE IN 1973 TO REBUILD SYSTEM PROVIDING VILLAGE MAKES COMMITMENT FOR O & M/OPERATING EXPERIENCE HAS BEEN A DISASTER

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	OWN WELL/1,000 GALLON	NOT TREATED
STORE	TORAGE TANK	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING OF GARBAGE AND TRASH

B. Domestic Sewage Disposal Method(s): PIT TOILETS/SEEPAGE PITS FOR SINK WASTES

C. History of Waste Disposal Projects: 1964 - PHS CONSTRUCTED PIT TOILETS/SEEPAGE PIT/NO DATA AVAILABLE ON OPERATING EXPERIENCE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL STORE CHURCH	100 x 100 x 6 LAGOON/SEPTIC TANK KEEPS SINKING INTO PERMAFROST SO IT IS NECESSARY TO KEEP ADDING LINE/ DISCHARGES TO LAGOON

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: STREAM OVERFLOW/ LOCAL DRAINAGE MAY BE A PROBLEM

Frequency: 40-60 YEARS

Severity: 20%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) DOWN

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: BIA GENERATOR

Fuels Available and Costs: NO DATA

D. Type of Commercial Transportation: AIR & BARGE SERVICE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita):

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

Area: 19,000 square miles Estimated Population: 6,750

Climate: Continental.
Average July temperature: Mid 40's to mid 60's.
Average January temperature: -16 to -4.
Annual Precipitation: 6 to 10 inches.

Principle Resources: Timber, fish and wildlife, waterfowl habitat, oil and gas, coal, potential for other minerals.

Major Sectors of the Economy: Government, subsistence, limited mining timber, and fishing.

The Central Yukon area is bordered on the south by the Kuskokwim Mountains and in the north by the Kokrine Hills and Ray Mountains. It consists of central lowlands which contain low forested hills surrounded by relatively low uplands having gentle ridges and slopes.

The area contains six villages, all located along the Yukon River. The villages are largely subsistence oriented. The large airport at Galena serves as a transportation center. Galena has the largest population with 631 people followed by Tanana with 447, and Nulato with 330.

The economy of the area is based mainly on government employment, subsistence, some mining and timber harvesting, and extremely limited fishing. Areas suitable for intensive use are limited and no major expansion of the economy is predicted.

Conclusions

This area's problems include:

1. Water availability.

   Permafrost restricts available groundwater. The higher lands away from the river system are all apparently underlain by permafrost. Thus, in locations removed from major rivers, the water available for domestic purposes and for summer mining activities is limited.

   Winter water often comes from ice melted at home for domestic use. This rigorous method reduces water consumption for domestic and related uses. In the summer the people haul water from both streams and ponds, sources often badly polluted from misdirected waste. This poses a hazard to personal health.

2. Water quality.

   The chemical quality of the groundwater varies with depth and with proximity to river systems. Generally, the waters are calcium bicarbonate type and are chemically acceptable for domestic use; however, deep wells contain highly corrosive water because of their low PH values. Shallower wells may have objectionable amounts of iron and dissolved solids.

3. Flooding.

   Spring flooding is a hazard to life, property, and water quality. Floods contaminate local surface waters by washing over the ground on which human or other wastes have been deposited.

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: ALLAKAKET

Population: 160 Class: 2ND

Region: DOYON LTD.

Number of Homes: 28

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: HAUL KOYUKUK RIVER WATER/PHS 35' WELL/HAND PUMP/ WELL CAPACITY 15 GPM

Adequacy of Present Supply: WELL PROVIDES GOOD QUALITY DRINKING WATER BUT IS UNTREATED/ Fe .44 ppm/HARDNESS 245 ppm/ RIVER HAS HEAVY SEDIMENT

Planned Improvements in Water Supply: PHS WILL COMPLETE REPAIR ON DAMAGED WELL AND INSTALL A WATERING POINT AND LAUNDROMAT IN SPRING 1979/GOOD QUALITY WATER WILL BE PROVIDED WHEN WORK IS COMPLETED/DISTANCE OF WELL FROM HOUSES MAY POSE A PROBLEM

History of Water Supply Projects: 1963 - PHS WELL AND PUMP HOUSE CONSTRUCTED AND ABANDONED BECAUSE OF SILTATION/1973 PHS AND SCHOOL DEVELOPED WATER SOURCE AND PHS PROVIDED HAND PUMP FOR WELL

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	OWN WELL	SEE ABOVE
STORES (2)	HAUL FROM SCHOOL	

II. WASTE DISPOSAL

A. **Solid Waste Disposal Method(s):** BURN AND DUMP AT A SITE OUT OF TOWN NEAR AIR STRIP/SITE IS LOCATED IN GULLY/VILLAGE IS CLEAN

B. **Domestic Sewage Disposal Method(s):** PRIVIES/CHEMICAL TOILETS AT TEACHER'S QUARTERS/SEEPAGE PITS TO SINK WASTES

C. **History of Waste Disposal Projects:** 1963 - PHS CONSTRUCTED 23 PRIVIES IN VILLAGE, ONE FOR EACH HOUSE AND THESE ARE STILL OPERABLE

D. Planned Improvements in Waste Disposal: PHS 3,000 GALLON SEPTIC TANK/SEEPAGE PIT FOR LAUNDROMAT IN 1979/TRENCH TYPE LAND FILL TO BE DEVELOPED AND FENCED IN 1979

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	PRIVIES/BIO-PURE PLANT IN OPERATION
STORES (3)	PRIVIES/BIO-PURE PLANT IN OPERATION
CLINIC	CHEMICAL TOILETS

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW

Frequency: 5-20 YEARS

Severity: 80%

B. Erosion

Type of Erosion: STREAM HAS ERODED AWAY THE BANK 20' IN FRONT OF THE VILLAGE

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FIRE FIGHTING IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: SCHOOL 2-100 kw GENERATORS, 1 PRIVATE 5 kw GENERATOR/VILLAGE 2-30 kw GENERATORS

Fuels Available and Costs: OIL $1.00 GALLON/GASOLINE $1.10-1.60 GALLON WOOD ALSO USED

D. Type of Commercial Transportation: AIR/SMALL BOAT/SNOW MACHINE

E. Economic Factors:

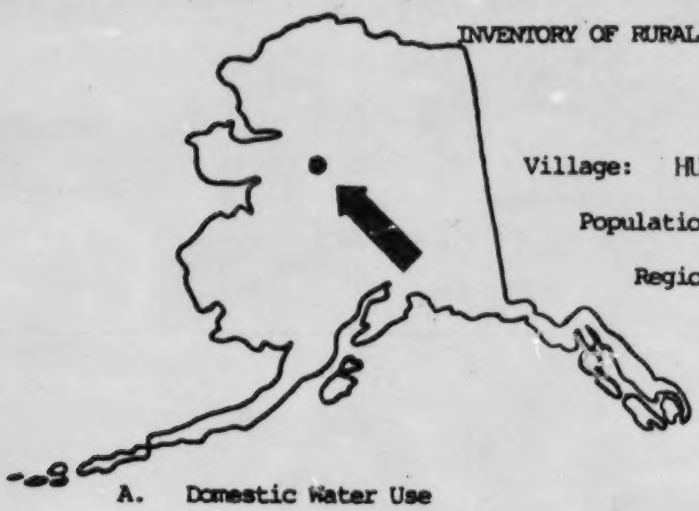
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $4,006

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month Year

Village: HUSLIA

Population: 225 Class: 2ND

Region: DOYON LTD.

Number of Homes: 57

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 72' WELL/BURIED PIPED SERVICE TO 25 HOMES/Fe FILTER/CL/FL/6 HOMES HAVE INDIVIDUAL WELLS/18 HOMES HAUL FROM COMMUNITY SOURCE

Adequacy of Present Supply: VERY GOOD SOURCE OF SUPPLY WHEN TREATED/Fe .66 ppm/TDS 238 ppm/HARDNESS 236 ppm

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: 1963 - PHS PROVIDED INDIVIDUAL WELLS TO 25 HOMES/MANY OF THE WELLS HAVE FROZEN/1975 PHS PROVIDED PIPED SYSTEM TO NEW AND EXISTING HOUSES/SYSTEM IS OPERATING WELL/GOOD VILLAGE SUPPORT OF THIS SYSTEM

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SYSTEM	SEE ABOVE
CLINIC	COMMUNITY SYSTEM	
STORE	HAUL FROM COMMUNITY SYSTEM	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): LAND FILL OUTSIDE VILLAGE/REFUSE BURNED IN BARRELS/ACCESS BY ROAD

B. Domestic Sewage Disposal Method(s): SEWAGE COLLECTION/SEPTIC TANKS/DRAIN FIELDS/FEW CHEMICAL TOILETS

C. History of Waste Disposal Projects: IN 1963, PHS BUILT SEEPAGE PITS FOR VILLAGE AND IN 1973 PHS INSTALLED 3 SEPTIC TANKS/NO OPERATING HISTORY AVAILABLE

D. Planned Improvements in Waste Disposal: NONE IN IMMEDIATE FUTURE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEEPAGE PIT
CLINIC	COMMUNITY SEPTIC TANK
STORE	PRIVY
CHURCH	SEPTIC TANK

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW

Frequency: EVERY FIVE YEARS OR MORE OFTEN

Severity: 90%

B. Erosion

Type of Erosion: HIGH RATE OF BANK EROSION

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: SUMMER FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 160 kw/$.37 kw WITH $18.20 MONTHLY MINIMUM

Fuels Available and Costs: GASOLINE $1.40 GALLON

D. Type of Commercial Transportation: AIR SERVICE FROM GALENA

E. Economic Factors:

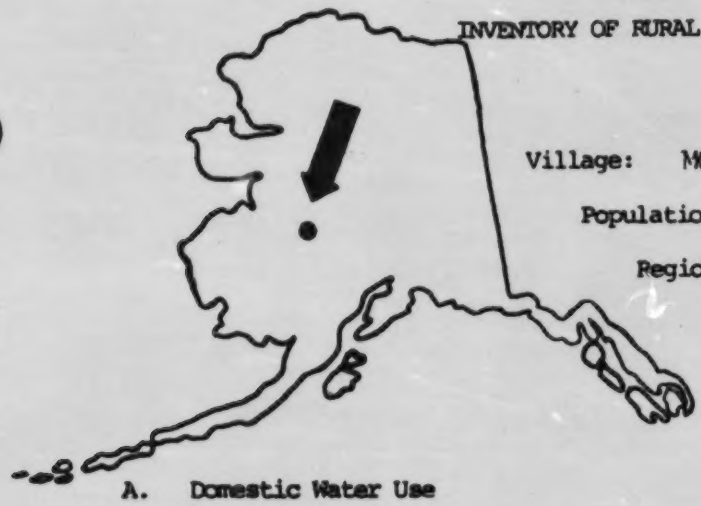
Sources of Village Revenue: FEDERAL & STATE REVENUE SHARING

Personal Income (per capita): $4,006

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NO DATA



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month Year

Village: MCGRATH

Population: 279 Class: 2ND

Region: DOYON LTD.

Number of Homes: 87

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 50 INDIVIDUAL 20-35' WELLS/THOSE WITHOUT WELLS HAUL FROM THOSE WHO DO HAVE WELLS/SOME USE RIVER WATER

Adequacy of Present Supply: ON A RECENT SAMPLE, SIX OUT OF EIGHT WELLS HAD COLIFORM/PROBLEM ESCALATES AFTER FLOOD/WOULD PROBABLY BE GOOD IF CL/QUALITY Fe .1 ppm/TDS 1261/ HARDNESS 861 ppm/SOME WELLS HIGH IN IRON

Planned Improvements in Water Supply: WASHATERIA PROPOSED FOR 1979 TO SERVICE NEW HOUSING/$400,000 STATE GRANT AVAILABLE IN 1979 FOR IMPROVEMENTS

History of Water Supply Projects: NONE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
BLM/FAA	OWN WELL	SEE ABOVE
SCHOOL	OWN WELL	
CLINIC	OWN WELL	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): VILLAGE HAS STARTED A COLLECTION SYSTEM AND LAND FILL/BORROW PIT IS THE SITE APPROXIMATELY 2 MILES FROM TOWN/BEAR PROBLEMS AT DUMP

B. Domestic Sewage Disposal Method(s): PRIVIES/SEEPAGE PITS/CESS POOLS/SEPTIC TANKS/DRAIN FIELDS

C. History of Waste Disposal Projects: GENERALLY SEPTIC TANKS SATISFACTORILY

D. Planned Improvements in Waste Disposal: PHS PLANS NOT YET DEFINED

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	SEPTIC TANK/DRAIN FIELD
CLINIC	SEEPAGE PIT
CLINIC (STATE)	SEPTIC TANK
MOTEL	SEPTIC TANK
FAA	SEWAGE LAGOON

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW

Frequency: 5-20 YEARS

Severity: 80%

B. Erosion NOT MUCH PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP

B. Seasonal Population Changes: INCREASES IN SUMMER FOR EMPLOYMENT

C. Power & Fuel:

Source(s) & Costs of Electricity: N.C. COMPANY/$.14/kw - 1ST 50 kw/$.12/kw NEXT 150

Fuels Available and Costs: OIL $.89 GALLON/GASOLINE $1.10

D. Type of Commercial Transportation: UNITED TRANSPORTATION BARGE SERVICE/COMMERCIAL AIR 3 TIMES A SUMMER

E. Economic Factors:

Sources of Village Revenue: FEDERAL & STATE REVENUE SHARING

Personal Income (per capita): $1,826

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

Area: 38,000 square miles Estimated Population: 5,500

Climate: Transitional and continental.
Average July temperature: Upper 40's to low 70's.
Average January temperature: -4 to 12.
Annual Precipitation: 19 inches.

Principle Resources: Fish and wildlife, minerals, timber.

Major Sectors of the Economy: Subsistence government employment, and limited servcies.

The Lower Yukon area ranges from sea level to an elevation of about 300 feet. The Yukon Delta provides one of the most important waterfowl habitat areas in the State. Inland from the Yukon Delta, valley lowlands are surrounded by rolling mountains. The lower 450 miles of the Yukon River is located within the area.

Most of the area's population live in 17 communities, located along the Yukon River. None of the communities exceeds 500 people. The economy of the area is primarily of subsistence type, augmented by government employment and limited services. Only slight economic growth is anticipated for this area.

Conclusions

The problems of this area include:

1. Water availability.

   The biggest problem is the lack of suitable water supplies.

2. Water quality.

   The villages of Alakanuk, Kotlik, Emmonak, and Sheldon Point must deal with saline groundwater. Other village water supplies are high in nitrate, sodium bicarbonate, or other chemical constituents. Quality of water available for coastal fish processing plants is not good. Some communities lack or have inadequate water distribution and sewage collection and treatment facilities.

   Land use conflicts are likely to occur between mineral and energy development interests and other users of the land. Wastes from drilling rigs and placer mines could degrade surface water quality and fishery habitat. Placer miners in the Marshall, Innoko, Moore and Flat Creek areas compete for water with salmon in late summer. Organic materials in the effluent from placer mines can depress dissolved oxygen in receiving streams.

   Increased siltation and sedimentation may occur with forest industries development and possibly with agriculture, placer and gravel mining.

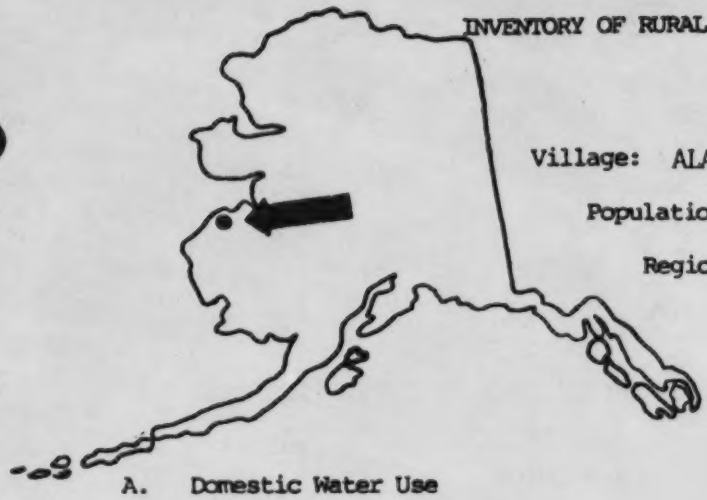
   Development of a road, utility, or oil pipeline networks may degrade the water quality of the streams, lakes, or wetlands crossed by or adjacent to the various transportation units. This may be particularly severe with regard to the great waterfowl habitats of the lower Yukon delta.

3. Flooding.

   Alakanuk, Emmonak, Holy Cross, Scammon Bay, Hooper Bay, Pitkas Point, and Pilot Station are especially subject to flooding.

4. Ports.

   The development of the minerals, energy, and fisheries industries is hampered by the lack of port facilities and protected anchorages along the coast and in the larger rivers.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: ALAKANUK

Population: 512 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 100

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: VILLAGE SAFE WATER CENTRAL SYSTEM/WATER SUPPLY/LAUNDRY AND BATHING FACILITIES

Adequacy of Present Supply: 4/30/78 COMPLETE CHEMICAL ANALYSIS DONE/GOOD QUALITY DRINKING WATER

Planned Improvements in Water Supply: NONE IN IMMEDIATE FUTURE

History of Water Supply Projects: VSW WATER LINE FROZE UP NOVEMBER 1976 DUE TO POOR CONSTRUCTION PRACTICES/REPAIRS MADE/AVEC POWER WENT OUT SPRING 1977/ FACILITY SHUT DOWN FOR 3 WEEKS/VILLAGE REQUESTED TAKE OVER O & M OF VSW FACILITY IN FEBRUARY 1977/VILLAGE HAS NOW ASSUMED FULL RESPONSIBILITY

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	PIPED TO VSW FACILITY	SEE ABOVE
SCHOOL	HAUL FROM VSW	
CLINIC	HAUL FROM VSW	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING ALONG ALAKANUK RIVER/ TRASH BURNING NOTED

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS/A FEW DUMP WASTE AT VSW FACILITY/INDISCRIMINATE DUMPING OF HONEY BUCKET WASTE ALONG RIVER ALSO NOTED

C. History of Waste Disposal Projects: HAUL DISTANCE TO VSW HONEY BUCKET DUMP POSES A PROBLEM FOR VILLAGERS

D. Planned Improvements in Waste Disposal: NONE IN IMMEDIATE FUTURE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL (HIGH)	PIPED TO VSW/GREY WATER TO SEEPAGE PITS
SCHOOL	VSW
CLINIC	HONEY BUCKETS
STORES (2)	HONEY BUCKETS
CITY OFFICES	HONEY BUCKETS

F. Other Contamination: FISH BY PRODUCTS DUMPED ON BEACH IN SUMMER CAUSING ODOR PROBLEMS AT LOW TIDE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/OVERFLOW

Frequency: EVERY YEAR OR MORE OFTEN

Severity: 100%

B. Erosion

Type of Erosion: STREAM BANK EROSION

Severity: VILLAGE RELOCATED IN 1967 TO AVOID EROSION PROBLEM

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 300 kw/$.37 kwh WITH $18.20 MONTHLY MINIMUM

Fuels Available and Costs: OIL $.70/GASOLINE $1.00 GALLON

D. Type of Commercial Transportation: BARGE/AIR CHARTER

E. Economic Factors:

Sources of Village Revenue: 1% SALES TAX/STATE REVENUE SHARING

Personal Income (per capita): $1,533

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: KOTLIK

Population: 288 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 58

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS WATERING POINT/ WELL WATER IS SOURCE/100,000 GALLON STORAGE TANK IS NOT IN OPERATION/ICE RAIN WATER SLOUGH ALSO USED

Adequacy of Present Supply: CHRONIC INTESTINAL DISORDERS REPORTED IN THE VILLAGE/PROBLEM MAY BE CONTAMINATED WATER SUPPLY/TURBIDITY & COLOR PROBLEMS PERSIST/VILLAGE DIVIDED BY SLOUGHS AND ACCESS TO WATERING POINT IS DIFFICULT

Planned Improvements in Water Supply: $400,000 STATE GRANT AVAILABLE IN 1979 FOR IMPROVEMENTS

History of Water Supply Projects: DUE TO MANY LEAKS AND OTHER PROBLEMS, THE STORAGE TANK IS NO LONGER IN USE AND WAS DISMANTLED DURING THE SUMMER OF 1976 AND NOW USED AS TEEN CENTER

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	PUMP FROM SLOUGH	SEE ABOVE
CLINIC	PUMP FROM SLOUGH	
STORES (2)	PUMP FROM SLOUGH	
COMMUNITY CENTER	PUMP FROM SLOUGH	
CHURCH	PUMP FROM SLOUGH	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING ALONG RIVER BANK/TRASH BURNED IN 55 GALLON DRUMS

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS DUMPED ALONG RIVER BANK OR INTO PIT PRIVIES

C. History of Waste Disposal Projects: PHS PROVIDED SEEPAGE PITS AND PRIVIES BUT PEOPLE STILL USE RIVER AS DUMP SITE/MOST PITS AND PRIVIES ARE FULL

D. Planned Improvements in Waste Disposal: NONE IN IMMEDIATE FUTURE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
BIA SCHOOL	BIOPURE EXTENDED AERATION PACKAGE PLANT

F. Other Contamination: INCINERATION OF SOLID WASTE/WASTE OIL

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW/COASTAL FLOODING

Frequency: 5-20 YEARS

Severity: 90%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): UP

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: NONE

Fuels Available and Costs: OIL $.86/GASOLINE $1.10 GALLON

D. Types of Commercial Transportation: BARGE 4 TRIPS/AIR SERVICE FROM EMMONAK

E. Economic Factors:

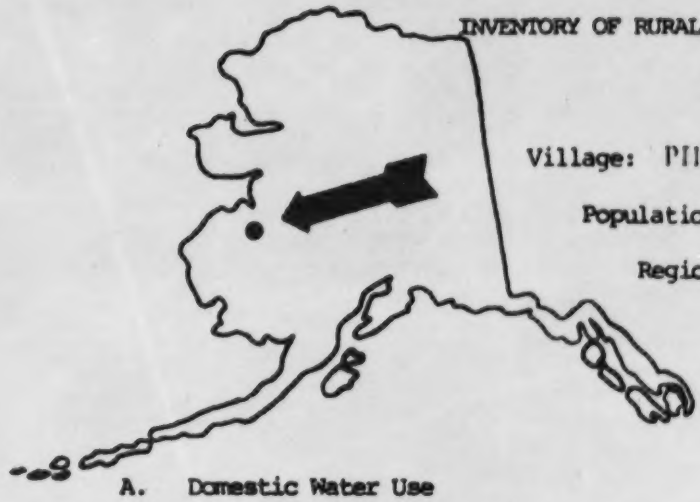
Sources of Village Revenue: 2% SALES TAX/FEDERAL AND STATE REVENUE SHARING

Personal Income (per capita): $1,533-$3,000

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: BIA REPORTS $228,000 EARMARKED FOR SANITATION IMPROVEMENTS IN 1980



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: PILOT STATION

Population: 315 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 58

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 200' WELL/14,000 GALLON STORAGE TANK/BURIED PIPES/PIPED SERVICE TO 28 ASHA HOMES/REST USE WATERING POINT/1/2 OF SYSTEM FROZEN/ PORTIONS OF VILLAGE IN FLOOD PLAN NOT SERVICED BY PHS

Adequacy of Present Supply: GOOD QUALITY, GOOD QUANTITY DRINKING WATER/Fe..14 ppm/CL 4 ppm/HARDNESS 138 ppm/TDS 220 ppm

Planned Improvements in Water Supply: NONE IN IMMEDIATE FUTURE

History of Water Supply Projects: PUMP HOUSE BURNED DOWN/REBUILT IN SUMMER OF 1972/FROZE UP WINTER OF 1973/SUMMER OF 1973 SYSTEM WAS RENOVATED AND WORKS FINE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	PIPED FROM COMMUNITY SUPPLY	SEE ABOVE
CLINIC	PIPED FROM COMMUNITY SUPPLY	
STORE	PIPED FROM COMMUNITY SUPPLY	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): PHS FENCED DUMP SITE/INDISCRIMINATE DUMPING AROUND VILLAGE

B. Domestic Sewage Disposal Method(s): PHS SEWER SYSTEM/2-4,000 GAL SEPTIC TANKS AND DRAIN FIELD/15 HOMES NOT ON PHS SYSTEM/DUMP HONEY BUCKET WASTES ONTO RIVER BANK

C. History of Waste Disposal Projects: VILLAGE HAVING PROBLEMS OPERATING AND MAINTAINING FACILITY

D. Planned Improvements in Waste Disposal: EMERGENCY PHS PROJECT IN 1979 TO REPLACE CRUSHED SEPTIC TANK

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	COMMUNITY SYSTEM
CLINIC	COMMUNITY SYSTEM
STORE	COMMUNITY SYSTEM

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW IN CITY FLATS

Frequency: 5-20 YEARS

Severity: 80%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 110 kw/$.37 kwh WITH $18.20 MONTHLY MINIMUM

Fuels Available and Costs: OIL $1.00/GASOLINE $1.10

D. Type of Commercial Transportation: EXTREMELY DIFFICULT FOR BARGES BECAUSE OF ICE CONDITIONS/AIR SERVICE

E. Economic Factors:

Sources of Village Revenue: 2% SALES TAX/REVENUE SHARING

Personal Income (per capita): $800

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: SHELDON'S POINT

Population: 110 Class: 2ND

Region: CALISTA CORPORATION

Number of Homes: 25

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 98' WELL/2,000 GALLON STORAGE TANK/WATERING POINT AT SCHOOL/ TREATED BY REVERSE OSMOSIS/CL/LAKES, ICE AND RAIN WATER ALSO USED FOR DRINKING

Adequacy of Present Supply: SCHOOL SOURCE IS SALTY/AMOUNT IS INSUFFICIENT/CHEMICAL QUALITY IS Fe 1.32 ppm/CL 3485 ppm/HARDNESS 970 ppm/TDS 5980 ppm

Planned Improvements in Water Supply: PHS WATERING POINT PROPOSED IN 1979

History of Water Supply Projects: DURING FALL FLOODING PEOPLE MUST TRAVEL 2 MILES TO FIND GOOD DRINKING WATER

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	SEE ABOVE	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING

B. Domestic Sewage Disposal Method(s): INDISCRIMINATE DUMPING OF HONEY BUCKET WASTE DUMPED ON TUNDRA

C. History of Waste Disposal Projects: BIA SEWAGE LAGOON

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
BIA SCHOOL	SEWAGE LAGOON

F. Other Contamination: VILLAGE IS FILTHY

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW/FALL STORMS

Frequency: A FIVE YEAR FREQUENCY OR MORE OFTEN WHEN SOUTH WIND BLOWS

Severity: 100%

B. Erosion

Type of Erosion: RIVER BANK

Severity: COULD BE SERIOUS PROBLEM IN FUTURE

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: BIA GENERATOR/PRIVATE GENERATOR

Fuels Available and Costs: OIL $1.00/GASOLINE $1.00

D. Types of Commercial Transportation: BARGE & AIR SERVICE

E. Economic Factors:

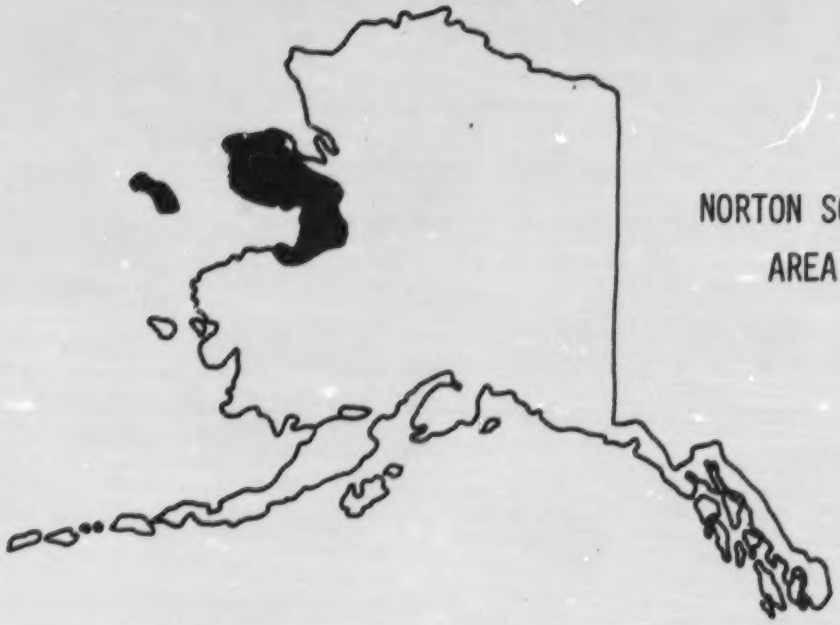
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $1,532

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: 5 HUD UNITS PROPOSED IN 1979



Area: 26,000 square miles Estimated Population: 6,700

Climate: Maritime, transitional, and continental.
Average July temperature: 30 to 50.
Average January temperature: 5 to 10.
Annual Precipitation: 15 to 20 inches.

Principle Resources: Fish and wildlife including sea mammals, minerals, and reindeer.

Major Sectors of the Economy: Commercial fishing and fur trapping, subsistence, government, tourism, and Native handicrafts.

The Norton Sound problem area encompasses the lands bordering Norton Sound which merges with the Bering Sea. The area is characterized by the intermingling of mountains and valleys and has an extensive coastline. From Cape Prince of Wales to St. Michael, the coastline consists of narrow beaches, with the land rising steeply behind these beaches. Permafrost is extensive.

The economy of the Norton Sound area is still primarily subsistence. Except for Nome and a few mining camps, communities are located to take advantage of available game, fish, and fuel. Economic activity is low in the area and is reflected in high unemployment rates and low per capita income. Government employment provides the primary source of cash in the area. Economic growth is expected from increases in mining and reindeer ranching, possible development in oil production, and increased tourism and recreation.

Conclusions

The major problems identified in this area include:

1. Water quality.

   Saline intrusion affects groundwater quality in coastal communities. Adequate water supply and sewage disposal systems are lacking in a majority of communities. Potential health problems are created and community and economic development is restricted.

   Drilling rigs, oil production facilities, and mineral processing plants have potential for degrading water quality. Aquatic habitat would be adversely affected.

   Lack of deep water ports will restrict industrial and economic development.

2. Water use.

   Inadequate funds for operation and maintenance of water and sewage systems could have adverse health effects and restrict community and economic growth.

   Potential conflicts between mineral and energy developers and subsistence and recreation users of water and adjacent lands could inhibit economic growth.

3. Flooding.

   Coastal storms cause flooding with resultant beach erosion and property damage.

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: COUNCIL

Population: 35 Class: UNINCORPORATED

Region: BERING STRAIT NATIVE CORPORATION

Number of Homes: 10

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 60' VSW WELL WATERING POINT/WIND POWERED GENERATOR

Adequacy of Present Supply: WELL PRODUCES 8-10 GPM DECREASING TO 3-5 GPM IN SUMMER/GOOD QUALITY WATER

Planned Improvements in Water Supply: VSW WILL REPLACE BROKEN WIND MILL IN 1979

History of Water Supply Projects: VSW WATERING POINT COMPLETED IN FALL 1978/ O & M SUPPORT FROM VSW

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	SEE ABOVE	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING BEHIND VILLAGE/UNCONTROLLED DUMPSITE ALSO USED

B. Domestic Sewage Disposal Method(s): PRIVIES/HONEY BUCKETS DUMPED BEHIND VILLAGE

C. History of Waste Disposal Projects: VSW INSTALLED 3 PRIVIES 1978

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
NONE	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: NONE

Frequency: LESS THAN ONCE IN 100 YEARS

Severity: 20%

B. Erosion NONE

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: INFLUX OF FISHERMEN IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: SCHOOL HAS 1 1/2 kw GENERATOR/10 kw PRIVATELY OWNED
Fuels Available and Costs: $.82 GAL. FOR GASOLINE

D. Types of Commercial Transportation: FERRY & TRUCK FROM NOME/AIR TAXI

E. Economic Factors:

Sources of Village Revenue: NONE

Personal Income (per capita): UNKNOWN

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: DIOMEDE (INALIK)

Population: 139 Class: 2ND

Region: BERING STRAITS NATIVE CORPORATION

Number of Homes: 18

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS WATERING POINT/ SPRING IS SOURCE/120,000 GALLON STORAGE TANK/ICE IN WINTER

Adequacy of Present Supply: WATERING POINT DOES NOT PROVIDE ENOUGH WATER FOR VILLAGE, ESPECIALLY IN WINTER

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: SYSTEM HAS FROZEN UP REPEATEDLY IN PAST FEW YEARS BECUASE OF POWER FAILURES AND O & M PROBLEMS/PHS THAWED SYSTEM IN 1977/ BIA WILL MAINTAIN SYSTEM WITH SCHOOL

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	SAME AS COMMUNITY	SEE ABOVE
CLINIC	SAME AS COMMUNITY	"
STORE	SAME AS COMMUNITY	"

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): DUMP ON ICE IN WINTER/OCEAN IN SUMMER

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS AND 55 GAL. DRUMS ARE DUMPED INTO THE SEA

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	CHEMICAL TOILET/2,000 GAL. BIO PURE PLANT
CLINIC	HONEY BUCKETS
STORE	HONEY BUCKETS

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding NONE

Type of Flooding:

Frequency:

Severity:

B. Erosion NONE

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): UP

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: CITY OWNED 175 kw

Fuels Available and Costs: OIL $.88/GASOLINE $1.80

D. Types of Commercial Transportation: AIR & BARGE SERVICE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $2,451

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: GOLOVIN

Population: 118 Class: 2ND

Region: BERING STRAITS NATIVE CORPORATION

Number of Homes: 20

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: HAUL ICE/RAIN WATER/ PHS CENTRAL FACILITY/LAUNDRY/BATHING/ 300,000 GAL STORAGE TANK/WATERING POINT

Adequacy of Present Supply: PHS FACILITY CLOSED/PROBLEM WITH SALTY SOURCE OF SUPPLY/STORAGE TANK EMPTY

Planned Improvements in Water Supply: PHS IMPROVEMENTS SLATED FOR 1979

History of Water Supply Projects: PHS WELL DRILLED IN JUNE 1975/HIGH IN CHLORIDES/ WELLS DRILLED IN 1976 PRODUCED SALTY WATER OR WERE DRY HOLES/QUALITY WAS Fe .1 ppm/ HARDNESS 957 ppm/TDS 4,661 ppm/CL 2,800 ppm

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	HAULS NOW/WILL BE HOOKED TO PHS	Fe 1.02 ppm/HARDNESS
CLINIC	HAULS WON'T BE HOOKED TO PHS	74 ppm/TDS 160 ppm
FISH CO-OP	HAULS WON'T BE HOOKED TO PHS	
REINDEER PLANT	SALT WATER WELL	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): DUMP ON BEACH AND BURN IN SUMMER/DUMP ON ICE IN WINTER/LANDFILL AND TRENCHES

B. Domestic Sewage Disposal Method(s): PRIVIES/HONEY BUCKETS

C. History of Waste Disposal Projects: NONE AS NEW SYSTEM IS NOT YET OPERATIONAL

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	2 - 1,500 GALLON SEPTIC TANKS
CLINIC	DUMP IN OCEAN
FISH CO-OP	DUMP IN OCEAN
REINDEER PLANT	DUMP IN OCEAN

F. Other Contamination:

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING

Frequency: 5-20 YEARS

Severity: 40%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): UP

B. Seasonal Population Changes: SUMMER INFLUX OF 200 PEOPLE FOR FISHING

C. Power & Fuel:

Source(s) & Costs of Electricity: PRIVATELY OWNED GENERATOR

Fuels Available and Costs: NO DATA

D. Types of Commercial Transportation: BARGE/AIR SERVICE

E. Economic Factors:

Sources of Village Revenue: FEDERAL AND STATE REVENUE SHARING

Personal Income (per capita): $2,451

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

Area: 33,000 square miles Estimated Population; 2,000

Climate: Continental.
Average July temperature: Mid 40's to mid 60's.
Average January temperature: -16 to -4.
Annual Precipitation: 14 inches.

Principle Resources: Timber, fish and wildlife, minerals.

Major Sectors of the Economy: Subsistence, limited government and service employment, small village timber mills.

The Koyukuk area lies in the west central part of the State and includes the Koyukuk River drainage and its tributaries. The area consists of a central lowland and surrounding uplands.

Five villages are located along the Koyukuk River and its tributaries. The area is sparsely settled and Bettles serves as a transportation and distribution center. The economy of the area is mainly subsistence. Service and government employee contribution to the economy is limited. Economic growth in this area is expected to depend on expansion of transportation, increases in mining and recreation, and initiation of commercial agriculture and forestry.

Conclusions

The problems here include:

1. Water availability.

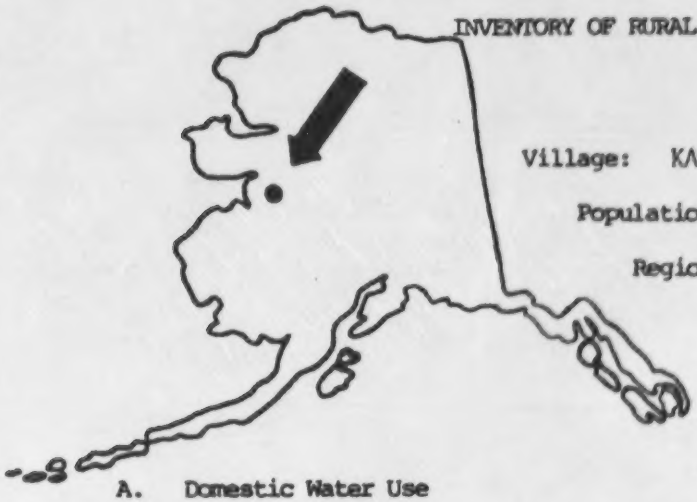
   Inadequate water supplies exist in some villages. Groundwater is limited by permafrost and is generally high in iron and dissolved solids. In many villages water distribution and sewage collection and treatment facilities are either inadequate or nonexistent; Allakaket and Evansville are examples. Villages generally lack the necessary funds or experience to operate and maintain required water supply and sewage disposal systems. Development may be constrained in some areas because of limited groundwater supplies for domestic and industrial purposes.

2. Water quality.

   Potential environmental hazards to the area's fish and wildlife could include placer operations and oil pipelines. Sediment from mining runoff can cover and smother stream bed habitat and depress dissolved oxygen in receiving waters.

3. Flooding.

   Flooding, with the attendent erosion and sedimentation, is a problem in the area, particularly at Huslia. Possible agricultural development could increase erosion and sedimentation. Erosion from gravel roads and gravel mining are also local problems.



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month / Year

Village: KALTAG

Population: 233 Class: 2ND

Region: DOYON LTD.

Number of Homes: 47

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 100' WELL/BURIED PIPES/PIPED SERVICE TO 39 HOMES/CL/FL Fe FILTER/MANY HOMES HAUL DRINKING WATER FROM STREAM

Adequacy of Present Supply: NOT GOOD/FURTHER Fe REMOVAL NEEDED/ WATER USED ONLY FOR WASHING CLOTHES/TREATED WATER QUALITY Fe 2.4 ppm

Planned Improvements in Water Supply: PHS WILL IMPROVE Fe REMOVAL OR DEVELOP NEW SOURCE IN 1979 TO ADDRESS IRON PROBLEMS/AN INFILTRATION GALLERY IS BEING CONSIDERED

History of Water Supply Projects: 1965 PHS WATERING POINT BUILT/1972 PHS PUMP HOUSE AND PIPED SYSTEM INSTALLED/OPERATIONAL PROBLEMS WITH IRON REMOVAL FILTERS HAS RESULTED IN POOR QUALITY WATER/STUDY AND DESIGN IMPROVEMENTS NEEDED TO IMPROVE WATER QUALITY

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	COMMUNITY SUPPLY	SEE ABOVE
STORE	COMMUNITY SUPPLY	
CLINIC	COMMUNITY SUPPLY	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): FENCED DUMP NEAR YUKON RIVER BUILT BY PHS IN 1965/SOME ROUTINE MAINTENANCE WITH SMALL STATE HIGHWAY CATS AS PART OF HIGHWAY MAINTENANCE

B. Domestic Sewage Disposal Method(s): PHS SYSTEM/DISCHARGES TO FACULTATIVE LAGOON AND YUKON RIVER

C. History of Waste Disposal Projects: 1972 - PIPED PHS COLLECTION SYSTEM TO LAGOON WHICH IS OPERATING FINE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	COMMUNITY SYSTEM
STORE	COMMUNITY SYSTEM
CLINIC	COMMUNITY SYSTEM
CHURCH	

F. Other Contamination:

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW

Frequency: LESS THAN ONCE IN 100 YEARS

Severity: 10%

B. Erosion NO DATA

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: FISH CAMPS

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 75 kw/$.37 kwh WITH $18.20 MONTHLY MINIMUM

Fuels Available and Costs: OIL $.80 GALLON/GASOLINE $1.25 GALLON

D. Type of Commercial Transportation: AIR SERVICE FROM GALENA

E. Economic Factors:

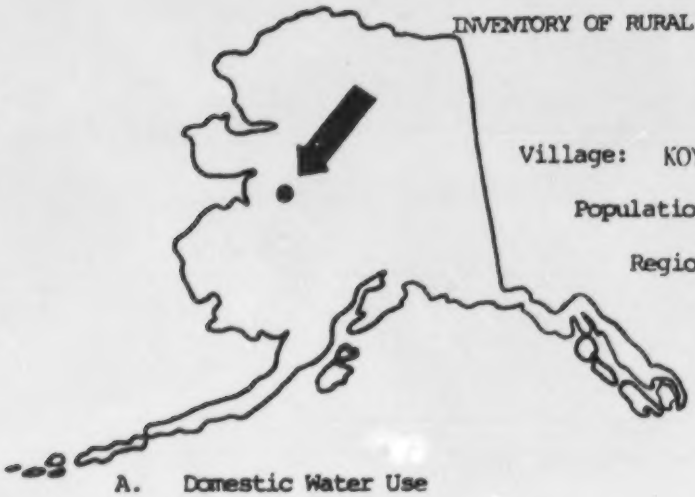
Sources of Village Revenue: FEDERAL AND STATE REVENUE SHARING

Personal Income (per capita): $4,006

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month / Year

Village: KOYUKUK

Population: 107 Class: 2ND

Region: DOYON LTD.

Number of Homes: 22

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: VILLAGE SAFE WATER CENTRAL FACILITY/BATHING, LAUNDRY WATERING POINT

Adequacy of Present Supply: GOOD QUALITY/GOOD QUANTITY WATER SUPPLY THE YEAR ROUND/ Fe .15 ppm/TDS 290 ppm/Mn .3 ppm/ HARDNESS 133 ppm

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: IN FALL OF 1975 DESIGN OF FACILITY COMPLETED/ 220' WELL DRILLED IN FALL 1975/CONSTRUCTION COMPLETED IN MARCH 1977 AT A COST OF $503,000/$500 A WEEK REQUIRED FOR OPERATION AND MAINTENANCE OF CENTRAL FACILITY/TECHNICAL, MANAGEMENT & FINAICIAL ASSISTANCE FROM VSW

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	OWN WELL	HIGH Fe
CLINIC	HAULS FROM VSW WELL	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING IN VILLAGE/DUMP SITE ALSO USED

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS/PRIVIES/VSW MULTI FLOW EXTENDED AERATION PLANT

C. History of Waste Disposal Projects: SYSTEM IS OPERATING SATISFACTORILY

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	HONEY BUCKETS/PRIVIES/SEPTIC TANK/SEPARATE PIT
CLINIC	PRIVIES
STORE	
CHURCH	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW

Frequency: 5-20 YEARS

Severity: 100%

B. Erosion

Type of Erosion: YUKON RIVER BANK SUBJECT TO CONSIDERABLE EROSION DURING HIGH WATER

Severity: 5' PER YEAR

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) DOWN

B. Seasonal Population Changes: FISH CAMPS IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: VILLAGE 15 kw GENERATOR/SCHOOL HAS GENERATOR

Fuels Available and Costs: GASOLINE $2.00 GALLON/DIESEL $.85 GALLON

D. Type of Commercial Transportation: COMMERCIAL AIR FROM GALENA/YUTANA BARGE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $4,005

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE IN IMMEDIATE FUTURE

Area: 41,000 square miles Estimated Population: 4,600

Climate: Arctic.
Average July temperature: Mid 30's to 60's.
Average January temperature: -20's to 4.
Annual Precipitation: Less than 20 inches.

Principle Resources: Fish and wildlife, sea mammals, reindeer, minerals.

Major Sectors of the Economy: Commercial fishing, reindeer herding subsistence economy, government spending.

The Kotzebue Sound area lies on Alaska's northwestern coast. Bordered to the north and south by mountains, this area includes the lands which drain into Kotzebue Sound. The climate is severe, and permafrost is found throughout the area.

The population of the area is small, and most communities are on the coast. The communities have traditionally depended on sea mammals for sustenance--blubber for oil, skins for clothing and boats, ivory for implements. Although elements of the cash economy have been added, much of the subsistence life style remains.

Slight but steady increases in population, transportation, reindeer ranching, forestry, commercial fishing, and tourism are anticipated in the future. Oil and gas development and increased mining is expected.

Conclusions

The problems encountered here include:

1. Water quality.

   Water quality is affected by saline intrusion of groundwater and suspended organic material in surface water throughout the area. There is a lack of adequate water storage, distribution systems, and integral sewage disposal systems in half of the communities. This affects health and restricts economic growth. Inadequate water quantity also resricts industrial growth in coastal communities. Shallow water inhibits deep water port facilities. Restricted water transportation inhibits industrial and economic development.

   Potential water quality degradation from oil and gas or mining operations could adversely affect aquatic habitat.

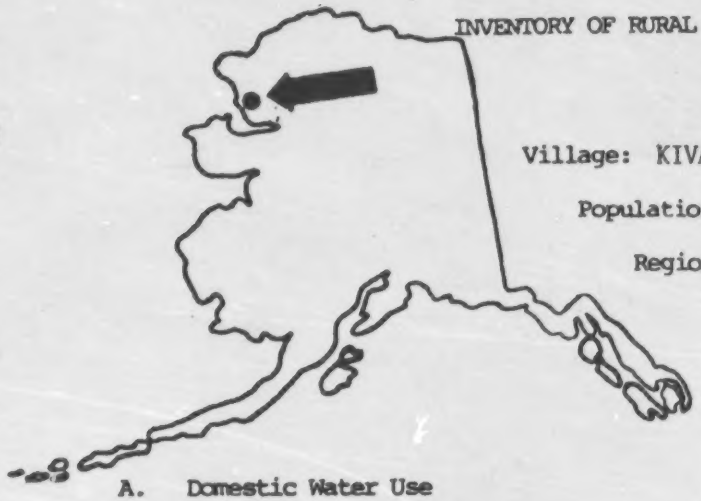
2. Water use.

   Competitive water and land use by mineral and energy developers and by subsistence and recreation users could restrict economic growth.

   Lack of funds for operation and maintenance of community water and sewage disposal systems could adversely affect health and future community and economic development.

3. Flooding.

   Periodic storms cause coastal flooding which inflict property damage and beach erosion.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: KIVALINA

Population: 209 Class: 2ND

Region: NANA

Number of Homes: 48

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS WATER INTAKE ON WULIK RIVER/600,000 GAL STEEL STORAGE TANK/CL/FL/WATERING POINT

Adequacy of Present Supply: Fe .10 ppm/TDS 1926 ppm/HARDNESS 246 ppm/SOURCE IS MUCH TOO FAR AWAY/SOME REFUSE TO USE PHS WATER BECAUSE IT'S CHLORINATED

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: NONE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL/CLINIC/STORE	COMMUNITY SUPPLY	STORAGE TANK TOO SMALL/ SHOWER WATER RATIONED

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): INDISCRIMINATE DUMPING/UNCONTROLLED SITE LOCATED 1 1/4 MILES FROM VILLAGE

B. Domestic Sewage Disposal Method(s): SEEPAGE PITS/HONEY BUCKETS DUMPED BEHIND HOUSES IN WINTER MONTHS/CHEMICAL TOILETS

C. History of Waste Disposal Projects: CHEMICAL TOILETS DON'T WORK/OVERLOADED/ PEOPLE CAN'T BUY TREATMENT CHEMICALS

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL/CLINIC/STORE TEACHERS' QUARTERS	PRIVIES/PACKAGE PLANT

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING

Frequency: 5-20 YEARS

Severity: 80%

B. Erosion

Type of Erosion: VERY LITTLE BEACH EROSION NOTED

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: OUT MIGRATION IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 206 kw/$.37 kwh WITH $18.20 MONTHLY MINIMUM

Fuels Available and Costs: OIL $.89/GASOLINE $1.22 PER GALLON

D. Type of Commercial Transportation: B & R TUG AND BARGE

E. Economic Factors:

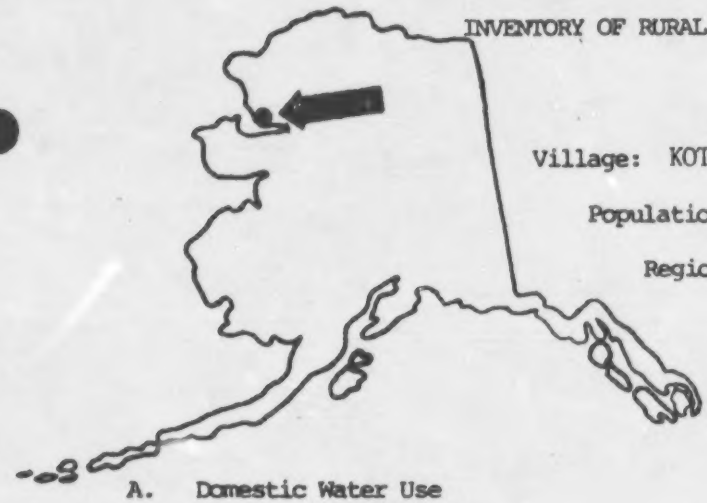
Sources of Village Revenue: 2% SALES TAX/FEDERAL & STATE REVENUE SHARING

Personal Income (per capita): $1,783

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: KOTZEBUE

Population: 2,431 Class: 2ND

Region: NANA

Number of Homes: 410

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 150 MILLION GALLON RESERVIOR/ALUM/POLYELECTROLYTE/PH ADJUSTMENT WITH CAUSTIC SODA ASH/ BURIED PIPES/SERVICE TO HOMES/CL/FL 1.5 MILLION GALLON STORAGE TANK

Adequacy of Present Supply: PIPES FREEZE IN WINTER/HIGH O & M COSTS/DEMAND MAY SOON EXCEED SUPPLY/Fe .80 ppm/TDS 110 ppm/ HARDNESS 78 ppm

Planned Improvements in Water Supply: 1979 PHS CONSULTANT EVALUATING SYSTEM IMPROVEMENTS MAY FOLLOW/WATER MAY BE AVAILABLE FROM SADY CREEK 6 MILES FROM TOWN/ $1.8 MILLION ABAILABLE FROM STATE GRANT IN 1979 FOR IMPROVEMENTS

History of Water Supply Projects: REPEATED PROBELMS WITH LINES FREEZING IN WINTERS OF 1970-71 AND 1973/CITY HAS PLANT OPERATORS AND SYSTEM MAY BECOME SELF SUSTAINING/1977-78 PHS ENLARGED TREATMENT PLANT FROM 100 GPM TO 180 GPM/ 100 NEW SERVICE LINES ADDED/UTILITY RATES WATER/SEWER $40.00 MO/GARBAGE COLLECTION $10.00/COLLECTION RATE IS LOW

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
ALL USE COMMUNITY SYSTEM		SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): CITY COLLECTION/BIG, MESSY DUMP IN SALT WATER LAGOON/SITE PARALLELS RUNWAY

B. Domestic Sewage Disposal Method(s): PHS SEWERAGE SYSTEM TO 32 1/2 ACRE EXTENDED AERATION LAGOON NEAR RUNWAY/ENLARGED IN SUMMER 1976

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
ALL ARE ON COMMUNITY SYSTEM	

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING

Frequency: 60-100 YEARS

Severity: 30%

B. Erosion

Type of Erosion: BEACH EROSION ON FRONT STREET DURING FALL STORMS

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP

B. Seasonal Population Changes: INFLUX OF PEOPLE IN SUMMER FOR WORK

C. Power & Fuel:

Source(s) & Costs of Electricity: KOTZEBUE ELECTRIC ASSOCIATION/3,400 kw/ $.26/kw - 1ST 50 kw/$.22 kw NEXT 50 kw

Fuels Available and Costs: OIL $.56/GASOLINE $1.04

D. Type of Commercial Transportation: BARGE/AIR TAXI/COMMERCIAL JET

E. Economic Factors:

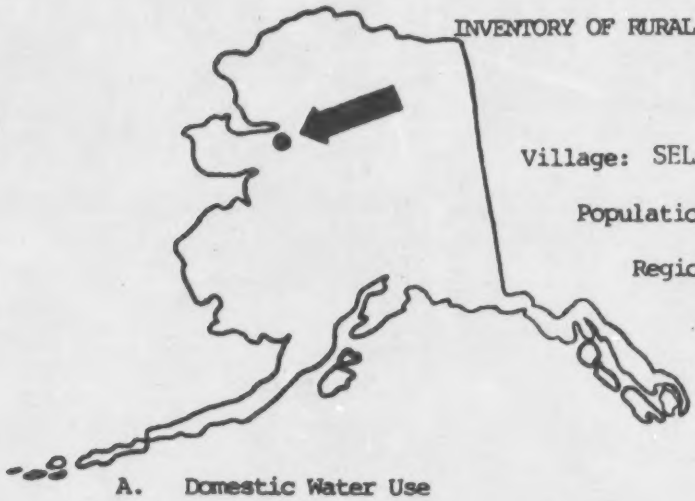
Sources of Village Revenue: 3% SALES TAX/FEDERAL & STATE REVENUE SHARING

Personal Income (per capita): $2,554

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: SELAWIK

Population: 525 Class: 1ST

Region: NANA

Number of Homes: 100

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: VSW CENTRAL FACILITY/ BATHING, LAUNDRY, SEWAGE DISPOSAL/ WATERING POINT WITH 4,000 GPD CAPACITY/ VSW ONLY USED FOR LAUNDRY BECAUSE PEOPLE DISLIKE PROCESSED WATER/ICE USED FOR DRINKING

Adequacy of Present Supply: ONLY ONE WATERING POINT FOR ENTIRE VILLAGE/HAULING DISTANCE IS A PROBLEM/Fe .51 ppm/HARDNESS 83 ppm/ TDS 174 ppm/GOOD QUALITY, GOOD QUANTITY DRINKING WATER

Planned Improvements in Water Supply: NONE

History of Water Supply Projects: STATE SCHOOL AND VSW FACILITY DESIGNED AND CONSTRUCTED UNDER JOINT CONTRACTS/VSW FACILITY COMPLETED IN 1975 AT A COST OF $1,100,000/ANNUAL O & M BUDGET IS $95,000 WITH SUPPORT FROM VSW

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOLS (2) STORE/COMMUNITY BUILDING/ CLINIC/FUEL DEPOT	PIPED FROM VSW HAUL FROM VSW	SEE ABOVE

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): PARTIALLY CONTROLLED DUMP SITE/SOME INDISCRIMINATE DUMPING/CLINIC INCINERATOR CANNOT HANDLE VILLAGE

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS DUMPED BEHIND HOUSES & ON RIVER ICE

C. History of Waste Disposal Projects: FACILITY HAS OPERATED CONTINUOUSLY EXCEPT FOR 2 OR 3 SHUTDOWNS OF APPROXIMATELY 1 WEEK DURATION DUE TO FREEZE UPS/ ODOR PROBLEM AT SEWAGE PLANT

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOLS/CLINIC/FUEL	PIPED TO VSW
DEPOT/COMMUNITY BUILDING	HONEY BUCKETS

F. Other Contamination: OIL SPILLED AROUND AVEC GENERATOR/GROUND SATURATED

III. FLOODING & EROSION

A. Flooding

Type of Flooding: STREAM OVERFLOW/ COASTAL FLOODING

Frequency: 5-20 YEARS

Severity: 60%

B. Erosion

Type of Erosion: SERIOUS EROSION PROBLEM

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP SLIGHTLY

B. Seasonal Population Changes: LEAVE VILLAGE TO FIGHT FIRES IN SUMMER

C. Power & Fuel:

Source(s) & Costs of Electricity: AVEC 250 kw/$.28 kw - 1ST 7 kw/$.22 kw OVER 75 kw

Fuels Available and Costs: OIL $1.25

D. Type of Commercial Transportation: WIEN/AIR TAXI

E. Economic Factors:

Sources of Village Revenue: FEDERAL & STATE REVENUE SHARING

Personal Income (per capita): $966

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: HUD REPORTS 18 UNITS TO BE CONSTRUCTED FALL 1979

Area: 81,000 square miles Estimated Population: 6,500

Climate: Arctic.
Average July temperature: Low 30's to low 50's.
Average January temperature: -20's to -5.
Annual Precipitation: 5 to 19 inches.

Principle Resources: Oil and gas, coal, sea mammals, wildlife.

Major Sectors of the Economy: Oil and gas, construction, government, services, subsistence living.

The southern border of the Arctic area is located in the northern terminus of the Pacific Rocky Mountain system--the Brooks Range. To the north, the land becomes gently rolling foothills, which flatten into the broad, treeless, tundra-covered coastal plains. The entire area is underlain by permafrost, and plant life consists of high brush at higher elevations and various types of tundra. The area supports large caribou herds and over 150 species of birds. Coastal areas support populations of seal, walrus, whale, and polar bear. Fish populations are unusually small for their age.

The economy of this sparsely populated area is a combination of monetary, barter, and subsistence factors. The harvesting of fish and wildlife remains extremely important to most of the inhabitants. Government is a major element in the economy, and with the North Slope oil discovery and construction of the trans-Alaskan pipeline, the oil industry has become the largest industry in the private sector. It is expected that growth in the area's economy will be based on continued exploration for and production of oil and gas.

Conclusions

The primary problems encountered in this area include:

1. Flooding.

   Flooding is an annual hazard along stream channels in the low coastal plain and along Arctic and Chukchi seacoasts. The principal flood-prone rivers are the Sagavanirktok, Colville, and Mead. Extensive flood damage has been reported in Deadhorse and Anaktuvuk Pass. Wetlands and lagoons are vulnerable to pollution by sediment from construction and to flooding by impeded drainages caused by roads and oil rig site construction. The formation of aufeis on rivers and in other drainage routes will affect transportation and is a potential source of damage to public lands. Coastal flooding is a threat to the security of shipping facilities. Areas affected are Wainwright, Barrow, Cape Lisbourne, Barter Island, and Point Lay. The periodically severe flood threat can hamper resource development.

2. Limited fresh water supply.

   In the arctic regions thereare not substantial usable groundwater resources due to permafrost. In the winter, surface water sources freeze to the bottom making water removal impossible. Limited supplies may restrict oil and gas exploration and production in Prudhoe Bay, Beaufort Sea and PET 4 areas. The increased use of surface water for petroleum production support will reduce supplies for freshwater fish production, resulting in habitat decline and reduced supply for subsistence.

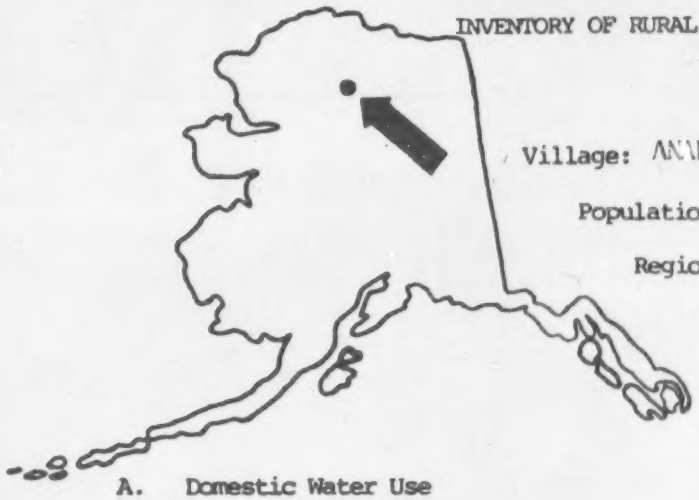
   Surface water quality will decline near population centers as water demands increase. Difficulties in treating arctic wastewater may lead to pollution of streams and ponds. Fish populations near population centers will be affected by declining water levels and toxic substances in their habitat.

3. Soil erosion.

   Potential surface soil erosion following natural or man-made disturbance is high. Permafrost melting is followed by sinkhole development and soil loss to running water with subsequent deposits in streams.

   Coastal erosion is severe at certain exposed sites along the Arctic Ocean and Chukchi Sea. Point Hope village is presently in danger.

   Roads, pipelines, and industrial community development on the Arctic Slope and coast must be regulated by stipulations such as those governing pipeline construction. These activities, with possible degradation of lagoons and wetlands, are hazards to large and important migrating populations of shore birds and water fowl.



INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: ANAKTUVUK PASS

Population: 150 Class: 2ND

Region: ARCTIC SLOPE REGIONAL CORPORATION

Number of Homes: 21

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS WELL/PUMP HOUSE
WATERING POINT/CL NOT IN USE/SCHOOL
WELL ALSO USED BY VILLAGE

Adequacy of Present Supply:
CHEMICAL QUALITY IS Fe .02 ppm/
HARDNESS 80 ppm/TDS 106 ppm

Planned Improvements in Water Supply: PHS PLANS TO EXPAND SYSTEM TO HOMES HAVE BEEN SCRAPED DUE TO LACK OF OPERATION AND MAINTENANCE OF SYSTEM

History of Water Supply Projects: SYSTEM BUILT BY PHS 1974-75 AT A COST OF $23,000/FACILITIES HAVE BEEN VANDALIZED/PUMP HOUSE DOOR DAMAGED AND PLUMBING MADE INOPERABLE/POOR OPERATION AND MAINTENANCE HAS PLAGUED SYSTEM

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	OWN WELL	SEE ABOVE
STORE	HAULING FROM SCHOOL	
CLINIC	HAULING FROM SCHOOL	

II. WASTE DISPOSAL

A. **Solid Waste Disposal Method(s):** BURN IN 55 GALLON DRUMS/UNCONTROLLED DUMP SITE IS LOCATED ON EAST SIDE OF RUNWAY APPROXIMATELY 1 MILE FROM VILLAGE

B. **Domestic Sewage Disposal Method(s):** HONEY BUCKETS/PIT PRIVIES BEHIND HOUSES

C. **History of Waste Disposal Projects:** NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	NSB AERATED LAGOON

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: ICE JAMMING/STREAM OVERFLOW/LOCAL DRAINAGE/RUNWAY OCCASSIONALLY FLOODED

Frequency: 5-20 YEARS

Severity: 10%

B. Erosion

Type of Erosion: NO PROBLEM

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP SLOWLY

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: NO DATA

Fuels Available and Costs: OIL $1.25/GASOLINE $1.36/BLAZO $1.49 GALLON

D. Type of Commercial Transportation: NENANA AIR SERVICE

E. Economic Factors:

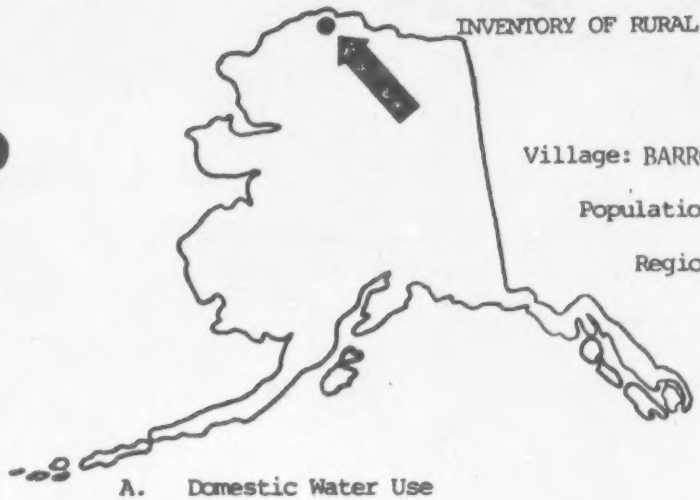
Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $2,413

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE IN IMMEDIATE FUTURE



INVENTORY OF RURAL SANITATION SERVICES

JAN / 1979
Month Year

Village: BARROW

Population: 2,307 Class: 1ST

Region: ARCTIC SLOPE REGIONAL CORPORATION

Number of Homes: 400

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: HAUL 3 MILES FROM EMAIKSOUN LAKE/ICE IN WINTER/HAUL SYSTEM OPERATED BY BARROW UTILITIES AND COSTS $.15 PER GALLON/PER CAPITA USE IS 10 GALLONS PER DAY

Adequacy of Present Supply: GENERALLY POOR QUALITY/ Fe 44 ppm/ HARDNESS 200 ppm/TDS 1377 ppm/ NO TREATMENT/SOURCE TOO FAR FROM VILLAGE

Planned Improvements in Water Supply: PHS CONTINUES EXTENSIVE WORK ON DAM/ STORAGE TANK IS SETTLING/CORRECTIONS UNDERWAY

History of Water Supply Projects: WATER SOURCE CONTAMINATED BY SEA WATER SO A DESALINIZATION UNIT WAS INSTALLED/WATER QUALITY IMPROVED BY CATCHING ICE MELT AND RUNOFF/PHS IMPROVEMENTS 1977/DAM/LINE TO TOWN/600,000 GAL STORAGE TANK/WATERING POINT/CL/FL/FILTRATION

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
HOSPITAL	PIPED PHS DISTRIBUTION SYSTEM	CL/DISTILLATION POOR
SCHOOL	PIPED DISTRIBUTION SYSTEM	QUALITY/WILL BE
HOTEL	BARROW UTILITIES	HOOKED TO NEW SYSTEM
NARL SITE	IMIKPUK LAKE	DESALINIZATION PLANT

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): HAULED TO OPEN, UNCONTROLLED DUMP 3 MILES FROM TOWN NEAR NARL SITE/OPEN BURNING NOTED/MUCH INDISCRIMINATE DUMPING AND WIND CONTAINMENT PROBLEMS

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS/PRIVIES/COLLECTED BY BARROW UTILITIES AND HAULED TO DUMP

C. History of Waste Disposal Projects: NARL AND BARROW MAINTAIN SEPARATE WASTE DISPOSAL SYSTEMS/1946 NARL USED 55 GALLON DRUMS DISPOSED ON BEACH/HEALTH PROBLEMS RESULTED/MIDDLE SALT LAGOON USED 1954-1961/1961 NARL AND CITY BEGIN USING SOUTH SALT LAGOON/1969 MIDDLE SALT LAGOON AGAIN USED BY NARL/NARL INCINERATOR NOT USED BECAUSE OF O & M PROBLEMS

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
HOSPITAL	EXTENDED AERATION
SCHOOL	EXTENDED AERATION
HOTEL	PHYSICAL/CHEMICAL PLANT
	RECYCLED WATER USED IN TOILETS

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding (BARROW IS ONLY 22' ABOVE SEA LEVEL) B. Erosion

Type of Flooding: COASTAL FLOODING/LOCAL DRAINAGE

Type of Erosion: BEACH

Frequency: 20-40 YEARS - MINOR FLOODING PROBLEM EXCEPT NEAR BROWERVILLE

Severity: NOT SERIOUS

Severity: 5%

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) UP

B. Seasonal Population Changes: NOT MUCH ANYMORE

C. Power & Fuel:

Source(s) & Costs of Electricity: BARROW UTILITIES 2,500 kw - 2-750 kw GENERATORS/$.15/kw - 1ST 200 kw/$.12/kw NEXT 300 kw

Fuels Available and Costs: GASOLINE $1.30 GALLON/FUEL OIL $1.50 GALLON

D. Type of Commercial Transportation: B & R TUG/AIR SERVICE

E. Economic Factors:

Sources of Village Revenue: REVENUE SHARING/3% SALES TAX/BOROUGH PROPERTY TAX

Personal Income (per capita): $2,282

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: NONE

INVENTORY OF RURAL SANITATION SERVICES

FEB / 1979
Month Year

Village: POINT LAY

Population: 51 Class: UNINCORPORATED

Region: ARCTIC SLOPE REGIONAL CORPORATION

Number of Homes: 24

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: 3 INLAND LAKES AND KOKOLIK RIVER USED/CONSUMPTION IS 7 GALLONS PER PERSON PER DAY/BOMBADIER HAUL VEHICLE USED TO TRANSPORT WATER

Adequacy of Present Supply: UNTREATED, UNDEVELOPED SOURCES OF SUPPLY/RIVER BECOMES SALINE WHEN ONSHORE WINDS BLOW

Planned Improvements in Water Supply: STATE $400,000 GRANT AVAILABLE IN 1979 FOR IMPROVEMENTS

History of Water Supply Projects: NONE

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
SCHOOL	SEE ABOVE	SEE ABOVE
DEWLINE SITE (10 MEN)	HAUL FROM TUNDRA LAKE	CL

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): OIL DRUMS AND OTHER DEBRIS SCATTERED ON BEACH/ TRASH DUMPED ON BEACH IN SUMMER AND ON ICE IN WINTER

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS DUMPED ON ICE/BOMBADIER HAUL VEHICLE USED TO COLLECT AND TRANSPORT WASTE

C. History of Waste Disposal Projects: NONE

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
DEWLINE SITE (10 MEN)	HUMUS TOILETS

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL

Frequency: 5-20 YEARS

Severity: 100%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable): STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: WIND PROJECT PROPOSED/BOROUGH POWER

Fuels Available and Costs: $1.05 GALLON HEATING OIL

D. Types of Commercial Transportation: COMMERCIAL AIR

E. Economic Factors:

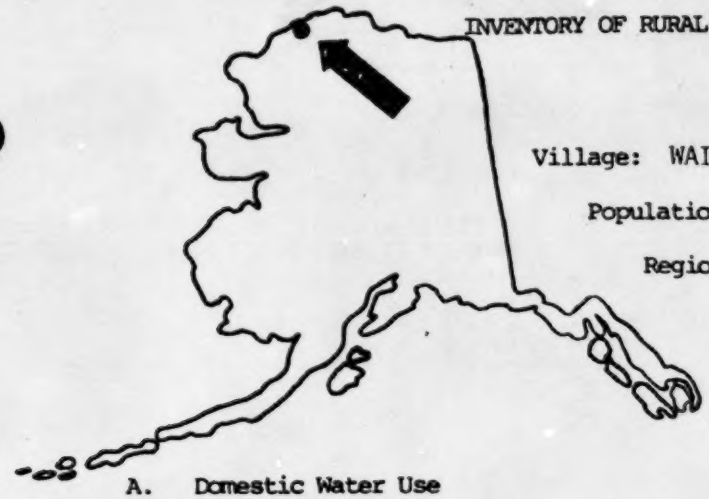
Sources of Village Revenue: FEDERAL REVENUE SHARING/PROPERTY TAX

Personal Income (per capita): NO DATA

Sources: private employment 0 % public employment 20 %

public assistance 80 %

F. Planned Housing and Other Capital Projects: NONE



INVENTORY OF RURAL SANITATION SERVICES

MARCH / 1977
Month Year

Village: WAINWRIGHT

Population: 341 Class: 2ND

Region: ARCTIC SLOPE REGIONAL CORPORATION

Number of Homes: 32

I. WATER SUPPLY

A. Domestic Water Use

Present Supply: PHS 1,000,000 GALLON STEEL STORAGE TANK/WATERING POINT/EPA CENTRAL FACILITY/BATHING AND LAUNDRY/ WATER TREATMENT/CL/HAUL WATER TO THE HOMES IN PHS TRACK VEHICLES

Adequacy of Present Supply: GOOD QUALITY/GOOD QUANTITY DRINKING WATER YEAR ROUND/TDS 200 ppm/NO COLIFORM PROBLEMS NOTED/HARDNESS 110 ppm

Planned Improvements in Water Supply: O & M OPTIONS UNDER CONSIDERATION BY EPA AND STATE OF ALASKA

History of Water Supply Projects: FIRE DESTROYED FACILITY IN 1973/IT HAS BEEN REBUILT/EPA HAS RUN OUT OF MONEY FOR O & M OF SYSTEM

B. Industrial & Institutional Use

Describe User	Present Supply	Adequacy
STORE	HAUL FROM COMMUNITY SUPPLY	SEE ABOVE
CHURCH	COMMUNITY SUPPLY	
SCHOOL	COMMUNITY SUPPLY AND OWN STORAGE TANKS	

II. WASTE DISPOSAL

A. Solid Waste Disposal Method(s): COLLECTION/DUMP SITE 4 MILES NORTHEAST OF VILLAGE

B. Domestic Sewage Disposal Method(s): HONEY BUCKETS/HAULED FOR FACILITY FOR DUMPING PRIVIES/MOST DUMP WASTE ON GROUND

C. History of Waste Disposal Projects: NO DATA

D. Planned Improvements in Waste Disposal: NONE

E. Industrial and Institutional Sewage Disposal Methods:

User	Method
SCHOOL	COMMUNITY SYSTEM
CHURCH	COMMUNITY SYSTEM
STORE	COMMUNITY SYSTEM

F. Other Contamination: NONE

III. FLOODING & EROSION

A. Flooding

Type of Flooding: COASTAL FLOODING/LOCAL DRAINAGE MAY BE A PROBLEM

Frequency: LESS THAN ONCE IN 100 YEARS

Severity: 10%

B. Erosion NO PROBLEM

Type of Erosion:

Severity:

IV. ADDITIONAL INFORMATION

A. Population Trend (up, down or stable) STABLE

B. Seasonal Population Changes: NONE

C. Power & Fuel:

Source(s) & Costs of Electricity: PRIVATE GENERATOR PROVIDES ENOUGH POWER FOR ONE LIGHT BULB PER HOME

Fuels Available and Costs: OIL $.86/GASOLINE $1.97 GALLON

D. Type of Commercial Transportation: AIR/BARGE SERVICE

E. Economic Factors:

Sources of Village Revenue: FEDERAL REVENUE SHARING

Personal Income (per capita): $2,413

Sources: private employment _____% public employment _____%

public assistance _____%

F. Planned Housing and Other Capital Projects: 4 HUD UNITS TO BE COMPLETED SUMMER OF 1977

Lesson IV — Government Programs in Alaska

Objective: Following a reading on how the Alaskan state government is involved in water quality improvement, students will be able to list ways in which the State 1) collects information, 2) sets standards, and 3) provides direct assistance to community projects.

Material: 1 student reading material: "How the Government Helps" (pp. 171-172)

Introduction: The State of Alaska is involved on several levels of maintaining and improving water quality. However, it is unlikely that the students are aware of these important governmental endeavors which affect their lives. The student reading material was taken from a 1978 Alaska Department of Environmental Conservation publication entitled Issues and Choices in Alaska's Environment. These six paragraphs will give examples of how the State government 1) collects information, 2) sets standards, and 3) is directly involved in improvement programs.

Further information is obtainable by writing directly to Alaska Department of Environmental Conservation, Pouch O, Juneau, Alaska 99811.

Vocabulary Preparation:

finite	methodology	redistribute
resource	sanitary	agencies
hydrologic	sanitation	authorized
network	casual	corporations
priorities	amendments	residents
facility	efficiently	

Instructional Activities:

1. Discuss with the class a water problem either from their own community or one that was learned about in the last lesson. Review what the problem is, what the consequences are to human health and welfare, and how that problem can be solved.

2. In the discussion bring out the State's role and responsibilities.

3. Ask the students what kind of assistance they would expect from the state government.

4. Inform the students that there are three main ways in which the state government helps maintain and improve water quality and write these on the chalkboard. They are 1) collects information, 2) sets standards (or creates laws), and 3) provides direct assistance.

(student response)

5. Tell the students that in the reading material which they will be given, they will learn about how the government helps ensure water quality.

6. Distribute the reading material, How the Government Helps.

7. Direct the students to find two examples each for the three categories of help which were just written on the chalkboard.

8. Students will find the correct responses in the following paragraphs: 1) collects information (written reports in paragraphs 1 and 2), 2) sets standards (specific acts created by the state in paragraphs 5 and 6), and 3) provides direct assistance (by providing personnel and funds in paragraphs 4,5, and 6).

9. Allow time to review the student responses in class. Ask that the parts of the paragraphs which have the correct information be read aloud.

Additional Activities:

1. Have students get in touch directly with various state agencies to discover more of what is being done to ensure water quality. Write local state political representatives and agencies listed in the introduction of these lessons.

Additional Agencies:

Southeast Regional Office
P.O. Box 2420
Juneau, AK 99803
789-3151

Wasilla Field Office
P.O. Box 1064
Wasilla, Ak. 99687
376-5038

Ketchikan Field Office
P.O. Box 7998
Ketchikan, Ak. 99901
225-6200

Soldotna Field Office
P.O. Box 1207
Soldotna, Ak. 99669
262-5210

Sitka Field Office
P.O. Box 540
Sitka, Ak. 99835
(132 Lincoln)
747-8614

Northern Regional Office
P.O. Box 1601
Fairbanks, Ak. 99707
(675 7th Ave.)
452-1714, 1715

Southcentral Regional Office
Rm. 1206
MacKay Bldg.
Anchorage, Ak. 99501
274-5527

Valdez Field Office
P.O. Drawer 1709
Valdez, Ak 99686
835-4698

Water is a finite resource with measurable limits. Without information on the quantity of water available in an area, local or state governments have difficulty developing sound land use plans which reflect the demands various land use activities will place upon the water resource. In the absence of such information, land use activities may be planned for and permitted which in the future might not only destroy existing fish and wildlife habitats, through over-allocation of the water supply, but may even find some activities threatened by water shortages. The extent of this problem is set out in the "Alaska Water Assessment Technical Report: State-Regional Future Water and Related Land Problems." This report states, "The projected water needs for Anchorage already exceed the present known supply. Heavy demands on the ground water sources have lowered lake levels in the Anchorage area. The Kenai Peninsula in some cases has experienced the same supply problems; the communities of Homer, Seward, Seldovia and Soldotna have had problems with their water supplies or distribution systems. Agriculture in the Matanuska Valley is hampered due to inadequate ground water supplies."

Management of water resources is a local concern and a State responsibility. According to the "Alaska Water Assessment Summary Report," "There is urgent need for a coordinated, statewide, basic hydrologic data-gathering network as well as a methodology to evaluate instream flow needs. In addition, there is significant need for basic knowledge of the effect of out-of-stream use of water on the instream environment."

Many Alaskans live in small communities which have neither safe drinking water nor sanitary methods for disposing of human wastes. While situations vary from one community to another, some generalizations can be made. In many communities, rural people use rainwater, ice, pond water, or rivers as a source of drinking water. Using such sources is a problem because these water supplies may be contaminated by improperly disposed human wastes. Casual honey bucket disposal may pollute water sources. In those areas where privies are used, these facilities may not be properly maintained. Annual flooding may redistribute wastes, contaminating children's play areas and surface water supplies. When wastes are disposed in local rivers, health problems for downstream residents may result.

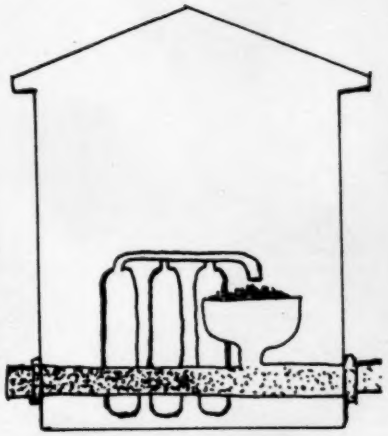
Several agencies share responsibility for assuring safe drinking water and sanitary disposal of wastes. For example, in State government, the Department of Environmental Conservation administers the Village Safe Water Act of 1970 which calls for construction of a water supply and waste disposal system for each village in Alaska which will accept title and operational and maintenance responsibility for the system. As of November 1979, eleven Village Safe Water projects have been built at costs ranging from $120,000 to $1,100,000. The Department of Environmental Conservation regional offices have field officers who can provide technical and management assistance

to communities. The Department of Health and Social Services' Public Health nurses provide education and information on basic personal sanitation.

In the federal government, the Public Health Service, Office of Environmental Health, is authorized by Public Law 86-121 to construct sanitation facilities in Native villages. The Office of Environmental Health, in addition to construction, provides environmental health services, including "technical assistance to improve sanitation." However, only a small percentage of sanitarians' time is spent on sanitation education activities not related to new systems. A larger percentage (estimated twenty-five percent) is spent on community education before and after water system construction. These public Health Service field people act as consultants to regional health corporations, some of which have accepted environmental health responsibilities for their areas. About seventy Public Health Service-funded Community Health Representatives work for regional health corporations to provide health prevention and health education sources in Native communities. Since each Community Health Representative responds to locally determined priorities, only some provide sanitation services.

Recently, there has been increased activity to address the problem of rural sanitation. Of 206 Alaska Native villages, 154 villages have water systems and 86 villages have sewer systems of some sort already installed or funded to be installed. However, it is unknown how many of these systems are currently operating, supplying safe water, and meeting the needs of the villages. The Village Safe Water program in the Department of Environmental Conservation has initiated a joint planning process with other responsible federal, State and loca' agencies. A comprehensive statewide program for village sanitation is the goal of this effort. The recently passed Clean Water Act Amendments call for federal participation in the Alaskan Rural Village Study and authorize funds for this effort. However, the completion of this planning effort is a couple of years in the future. Even when complete, it will be years before some villages receive water and sewer systems that meet local needs efficiently and effectively in a manner convenient to residents.

Lesson V Solutions to Community Problems



Objective: Students will be able to develop a list of recommendations to provide cleaner, safer water for their community and/or region.

Materials: reprints from Lesson III's reading material which relate to your region's water quality.

Introduction: This lesson provides an opportunity for the students to become directly involved with water quality problems with which they live. If there is an acknowledged water quality problem in the community, this can be made the subject of study. If no immediate community problem exists, use the regional information to provide the problem or problems on which the students can apply their problem-solving abilities.

The problems should be real ones, preferably ones with which the students can identify. If it seems appropriate this learning project can be given further real-life applicability by helping the students to present their ideas to a local, regional or state government representative.

Instructional Activities:

1. If an acknowledged water quality problem exists in your community, discussion should start with that. If not, review what has been written about the problems in your region.

2. Using the students' input, write a concise statement of a community problem on the chalkboard or list succinctly several community or regional problems if more than one can be easily identified.

3. Review with the students how the state government can help (collect information, set standards, and become directly involved). Also ask the class to identify other sources of possible assistance (federal government, local government, individuals, families, local organizations, and businesses).

4. List these sources of assistance on another part of the chalkboard.

5. Divide the class into groups. The size of the groups will vary according to the instructional capabilities of the class.

6. Direct the groups to decide how they would solve the problem or problems.

7. The group should list ways in which each of the sources of assistance could or should relate to the need for improved water quality.

8. Allow time for each group to report back to the class on their ideas.

9. Discuss the ideas in terms of their practicality. Note the ideas on the chalkboard under each source of assistance.

10. When all reports have been completed, review the ideas and have the class decide on the one or two in each category that seems as though it would be the best response to the problem.

Additional Activities: If it seems appropriate, help the class put their ideas into action or at least have the ideas presented to local, regional, or state government body.

CURRICULUM FEEDBACK FORM

Unit used_____ Grade Level _____ Name_____

Age Level_____ # of Children_____ Address_____

Type of Group (school class, scouts, etc.) _____

_____ _____

Approx. hours spent on unit_____ _____

Comments_____ _____

_____ _____

_____ _____

_____ _____

1. Background information was: Just what I needed I needed more unnecessary
2. How many follow-through suggestions were used?
3. Instructions were easy to follow? yes___ no___
4. Children were interested? ___ ___
5. Suggested discussion questions worked well? ___ ___
6. I will use this unit again ___ ___
7. I used other grade-level units to supplement the one for my group's age ___ ___

Please describe below any adaptations you made or improvements you suggest:

Please mail this form to the address listed on the back, and THANK YOU VERY MUCH FOR YOUR HELP!

fold

(Stamp)

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